SIEMENS

UROSKOP D2

RX

Wiring diagrams
Unit/Generator

Function description

Register 1

RLL5-310.041.02.01.02 English

Replaces: RLL5-310.071.01.02.02 **07.93**

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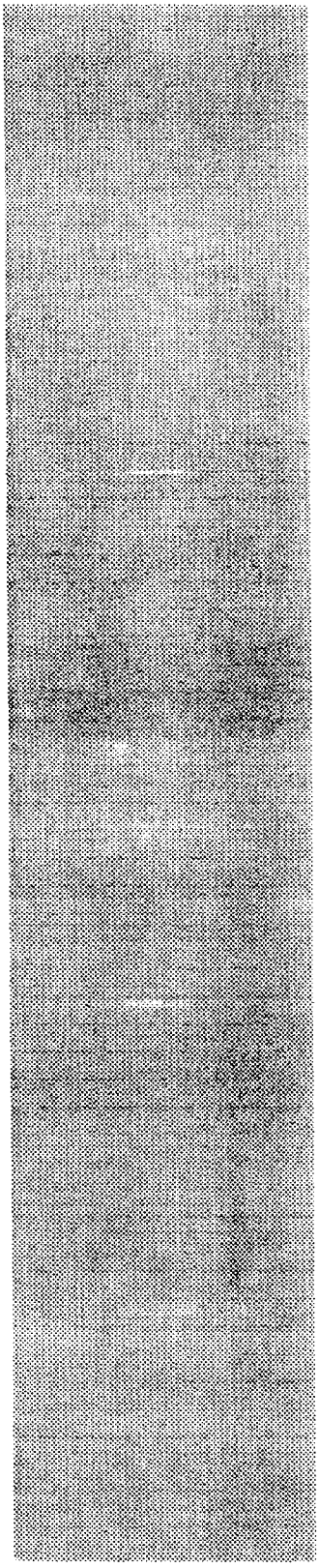
Contents

		Page
	Notes	5
Chapter 1	Introduction	1-1
Chapter 2	System run-up	2-1
Chapter 3	Safety circuit	3-1
Chapter 4	Motor control	4-1
Chapter 5	Unit interfaces	5-1
Chapter 6	Memory control	6-1
Chapter 7	PC board block diagrams	7-1
Chapter 8	Mechanical	8-1

Contents

Page

Notes



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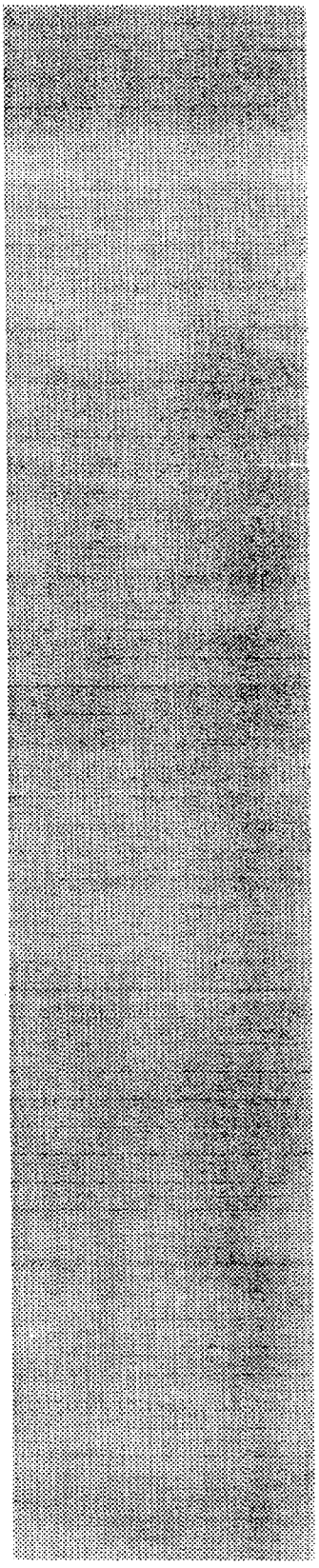
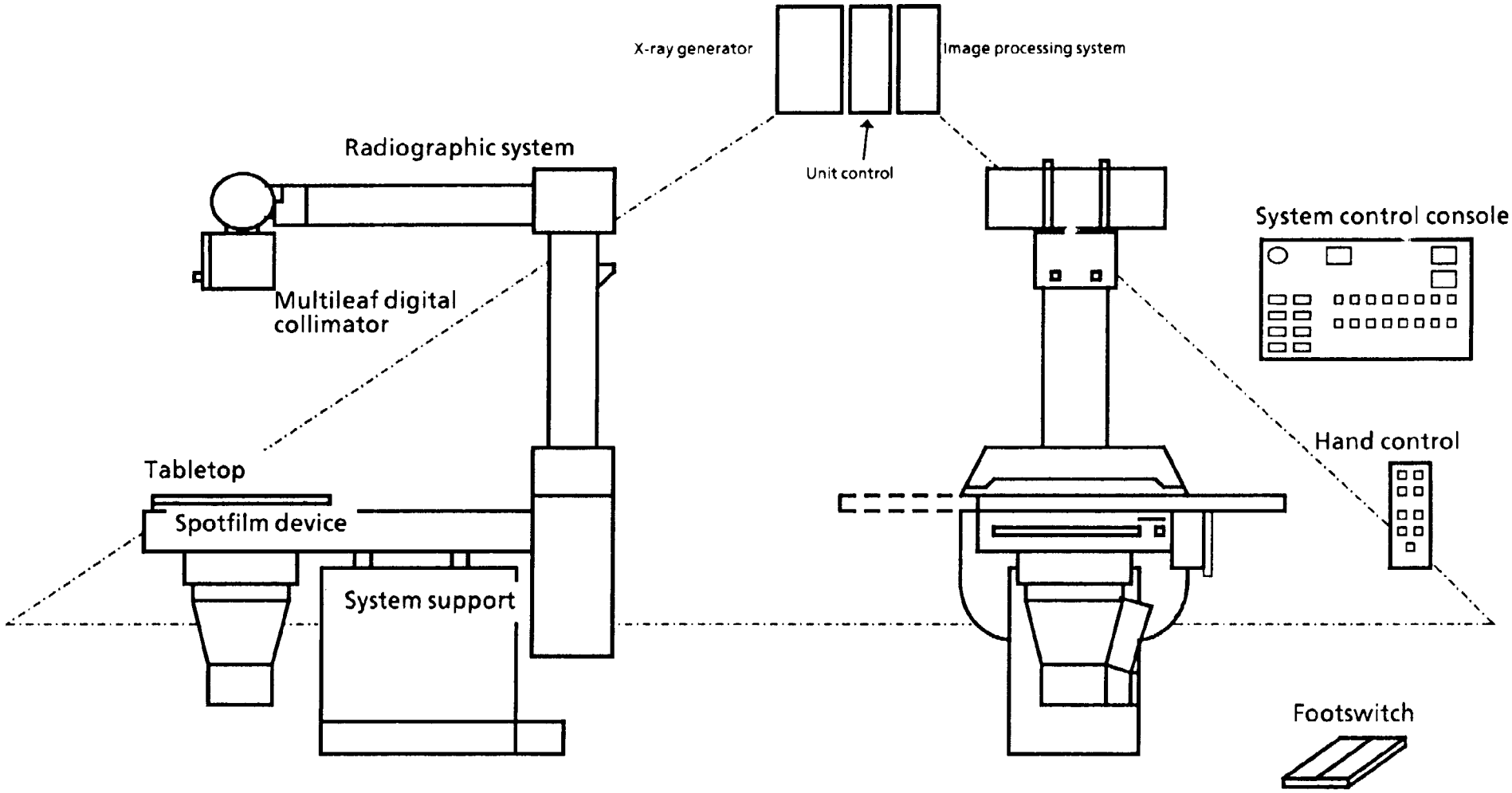


CHAPTER 1

Introduction

System survey	1-2
General information	1-3
Unit components	1-4
Unit modules	1-6
System cabling	1-8
System control panel	1-10
Tableside control panel	1-14
System block structure	1-16


X-ray generator
Image processing system
Unit control
Radiographic system
Multileaf digital collimator
System control console
Hand control
Tabletop
Spotfilm device
System support
Footswitch

Radiological instrumental workstation

Uroskop D is a radiological instrumental workstation for urological x-ray diagnosis and therapy. It fulfills the special requirements resulting from this:

- good radiographic and examination conditions
- comfortable patient positioning
- good accessibility to the patient
- examinations on the recumbent and standing patient
- ergonomic operation
- optimal hygienic conditions
- low space requirement

and offers all possibilities of urological diagnosis and therapy:

- Routine examinations and treatments under radiographic control
- Interventions under fluoroscopy control
- Nephrotomographies and vesiculographies with two tomographic angles (8° and 20°) plus oblique radiation ± 15°.
- Nephrolitholapaxy with special PCN set
- Function diagnosis with I.I.-TV system

Differences as compared with the Uroskop 2 system

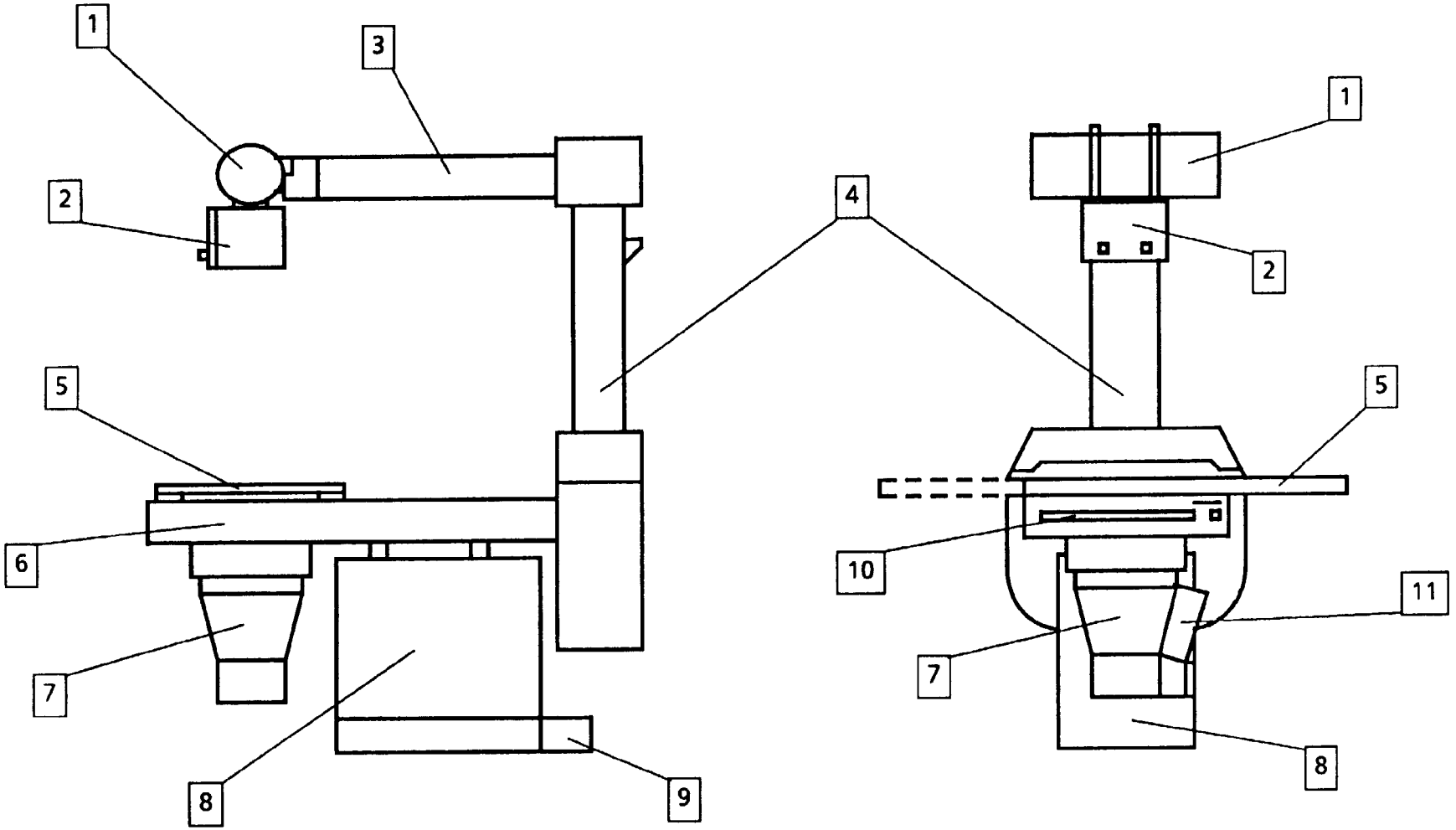
The Uroskop D system offers the following improvements as compared with the previous system:

- shorter tabletop
- improved accessibility
- tomography software controlled instead of with mechanical coupling as previously
- comfortable spotfilm device with two format subdivisions
- jerk-free system movements
- digital radiography

Unit configuration Uroskop D1, D2, D3

The following components are available:

- System support
- Tabletop
- Radiographic system (tube support arm with tube)
- Control units
  - System control panel
  - Tableside control panel
  - IR control panel
- X-ray generator and image processing system
  - D1: Polydoros 50S, Sirecon Kompakt, memory for 2 images
  - D2: Polydoros 80S, Videomed N, memory for 50 images
  - D3: Polydoros 80S, Videomed H1X, Fluorospot H
- Multileaf digital collimator
- Spotfilm device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9
1
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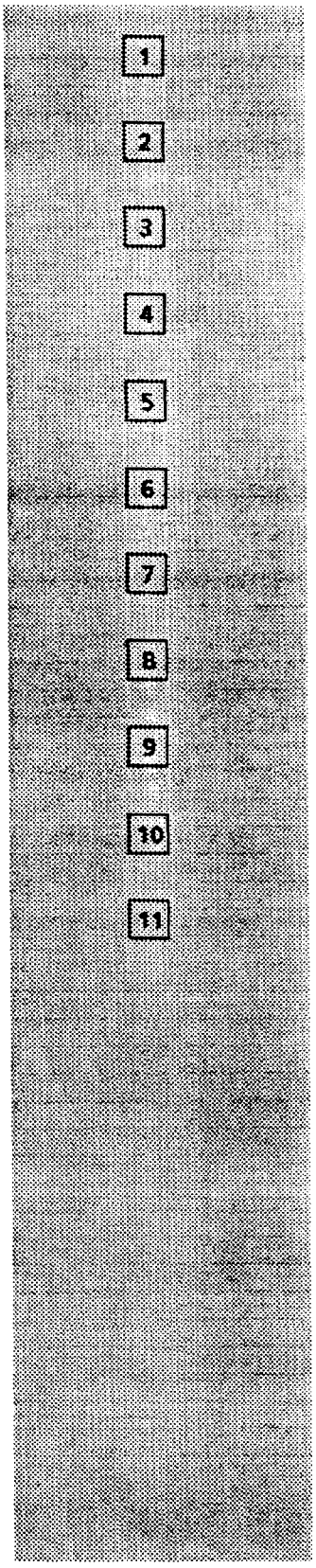
11
7
8



1 Optilix 150 / 30 / 50 or 150 / 40 / 82 C tube unit

2 Multileaf digital collimator

3 Tube unit support arm

4 Swivel column

5 Tabletop

6 System support with spotfilm device

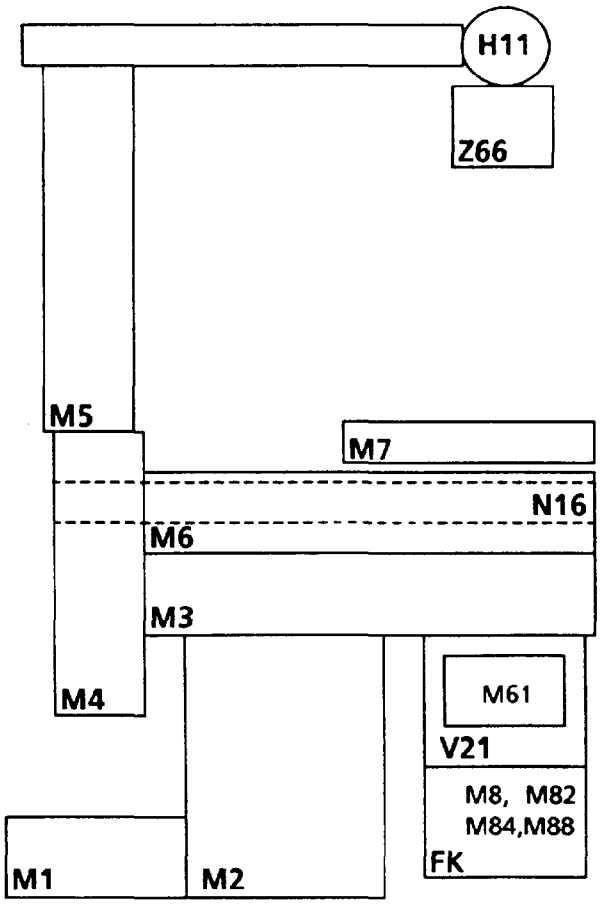
7 X-ray image intensifier 23 / 33 / or 40 cm

8 Unit base with lifting and tilting drive

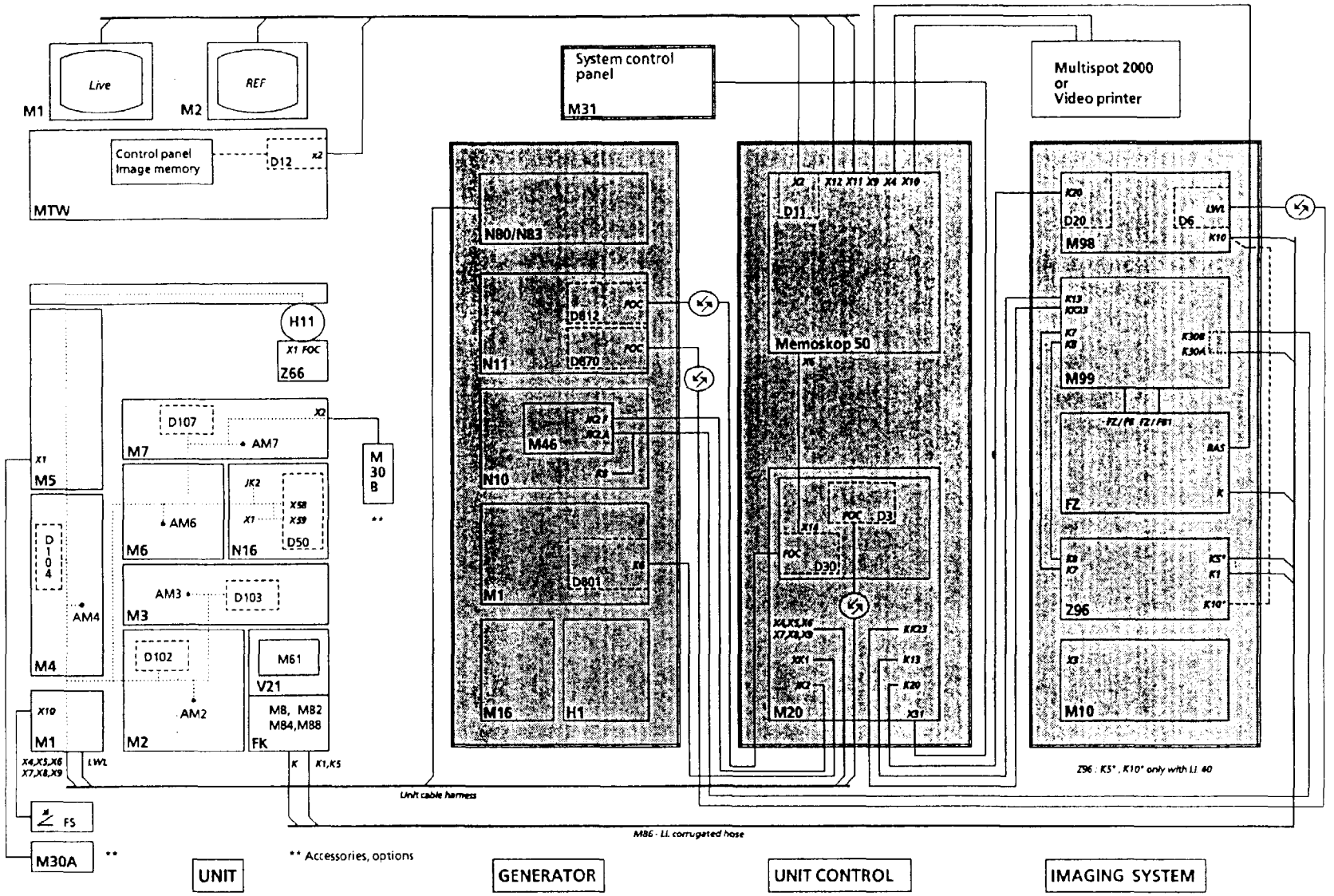
9 Unit connection

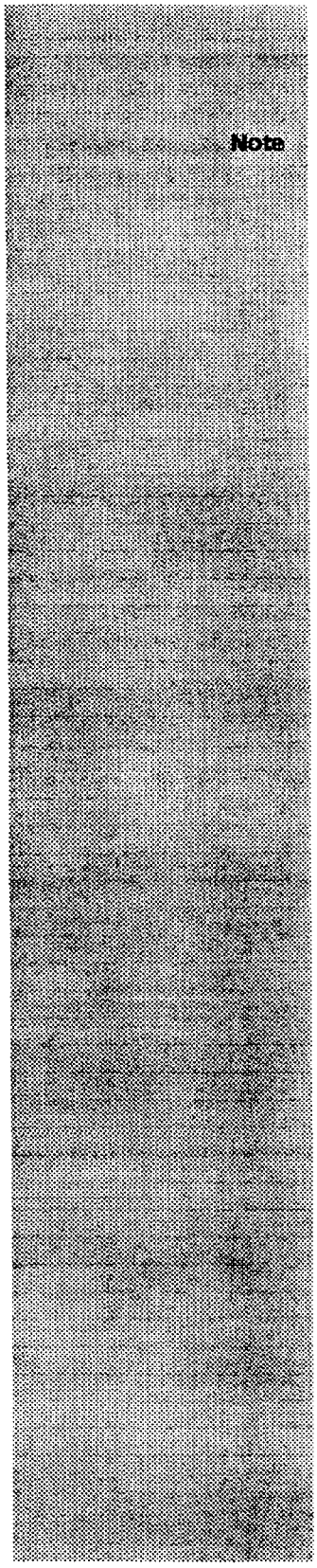
10 Spotfilm device, front loading shaft

11 TV camera (Videomed N)


H11
Z66
M5
M7
N16
M6
M3
M4
M61
V21
M8, M82
M84,M88
FK
M1
M2

H11	X-ray tube
Z66	Multileaf digital collimator
V21	X-ray image intensifier
TV	TV camera
M1	Cable connection
M2	Telescope lifting base
M3	Tilting unit
M4	Column swivel unit
M5	Tube unit support arm
M6	Unit support
M7	Tabletop

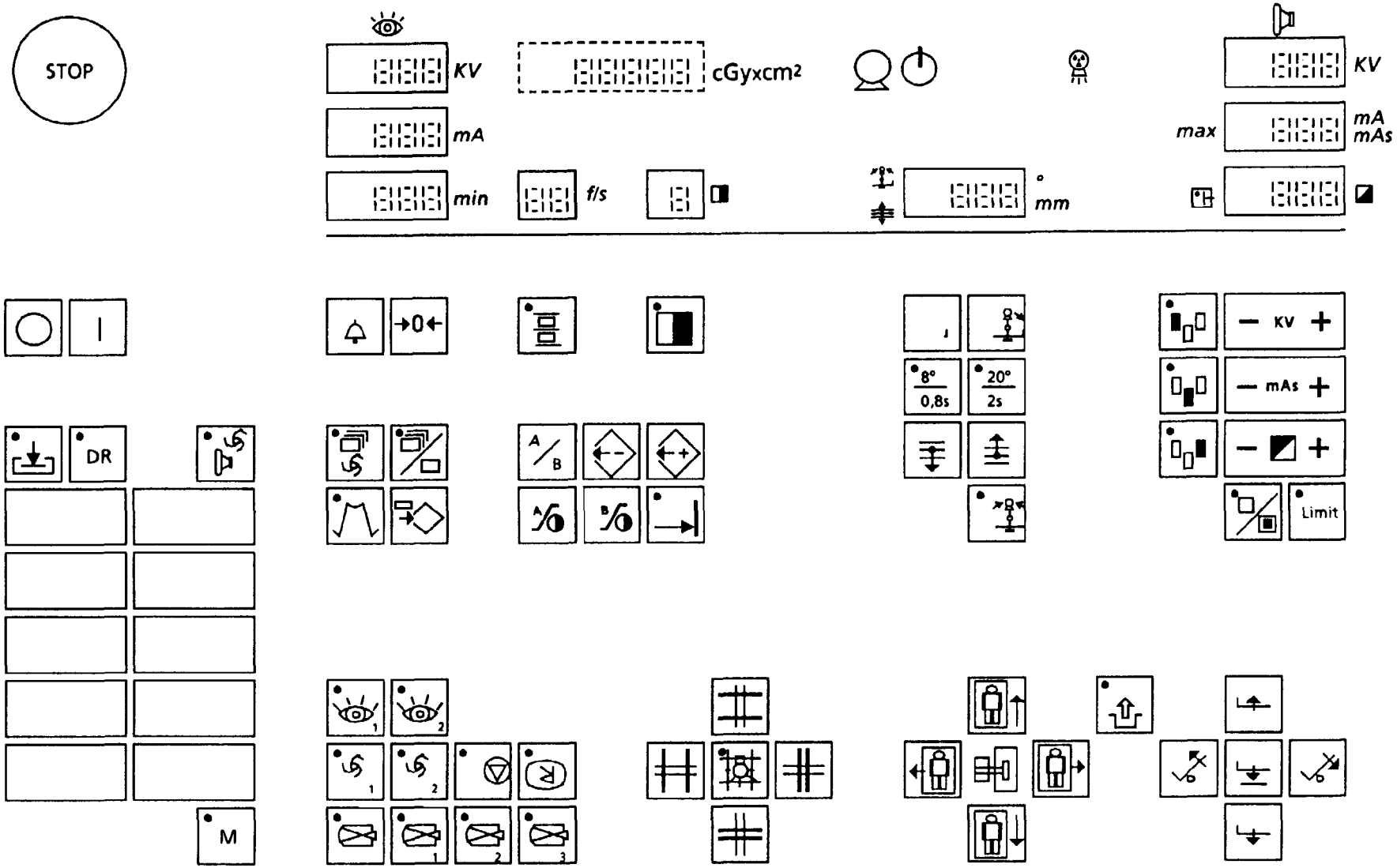

M1
Live
M2
REF
MTW
Control panel
Image memory
D12
X2
System control panel
M31
Multispot 2000
or
Video printer
N80/N83
D812
N11
D870
M46
N10
M1
D801
M16
H1
D11
Memoskop 50
M20
D20
M98
D6
M99
FZ
Z96
M10
H11
X1 FOC
Z66
M7
D107
AM7
M5
M6
AM6
N16
D50
M 30 B
D104
AM4
M4
AM3
D103
M3
D102
AM2
M2
M61
V21
M8, M82
M84,M88
FK
M1
X4,X5,X6
X7,X8,X9
LWL
K
K1,K5
FS
M30A
Unit cable harness
M86 · LL corrugated hose
Z96 : K5*, K10* only with LL 60
** Accessories, options
UNIT
GENERATOR
UNIT CONTROL
IMAGING SYSTEM



The system cabling diagram shows the arrangement of the cabinets in the correct order with the associated cables.

Note

The arrangement shown is an example. In practice options may be installed, thus making the arrangement look different (see system pages).


STOP
KV
cGyxcm²
mA
min
f/s
KV
max
mA
mAs
mm
DR
M
KV
mAs
Limit

Control console areas

The control console consists of the following areas:

- Startup
- Technique selection and organ program selection/memory
- Fluoroscopy/memory operation/memory control
- Exposure/memory operation/tomography/Bucky
- Unit movement
- Multileaf collimator
- Generator exposure parameters

Startup

System on/off (system start routine)
Emergency stop switch (safety circuit)

Technique selection and organ program selection with orgram program memory

Direct technique (spotfilm device)
Indirect technique (digital radiography)
Zero-point technique

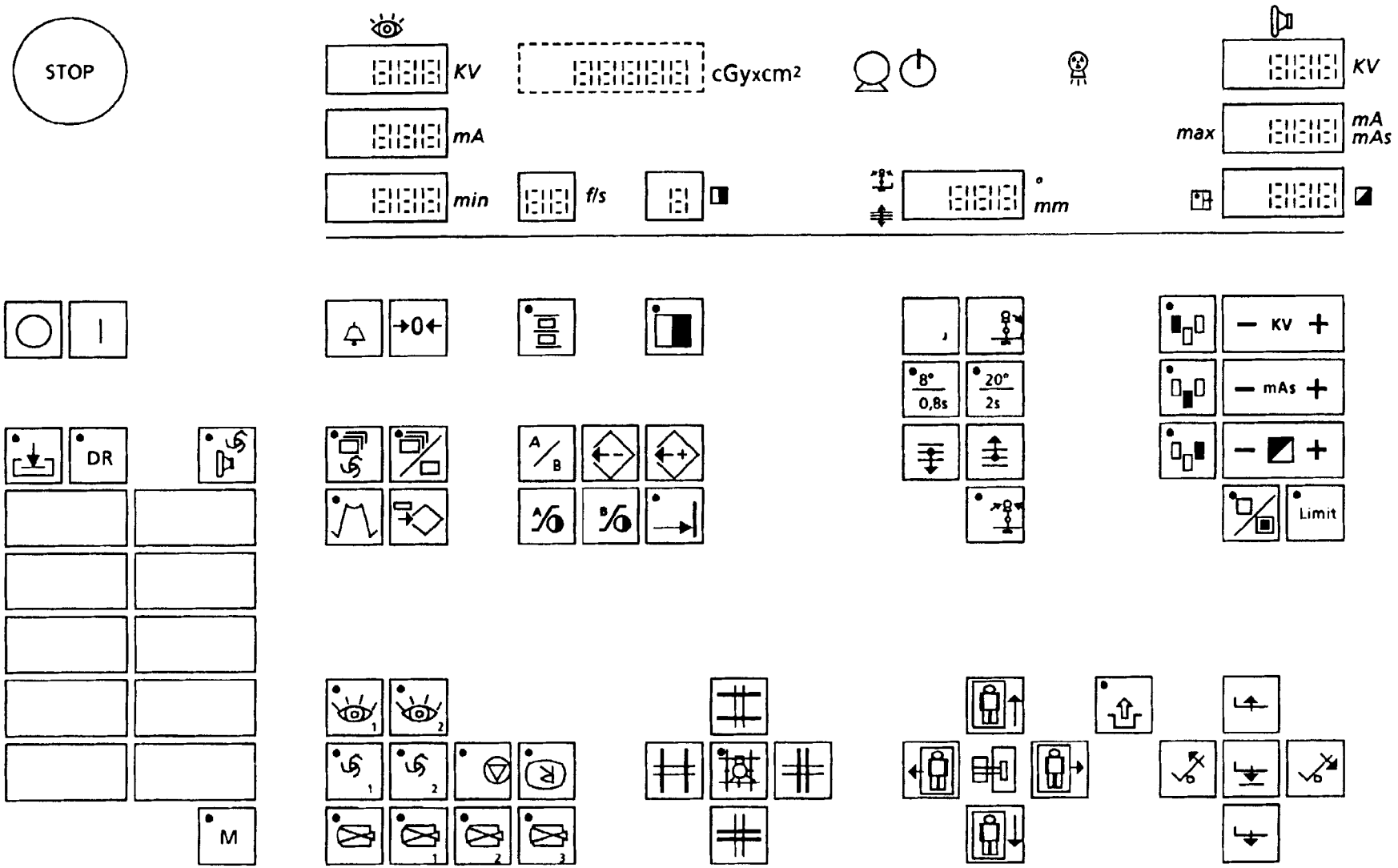
Organ program selection
Organ program memory

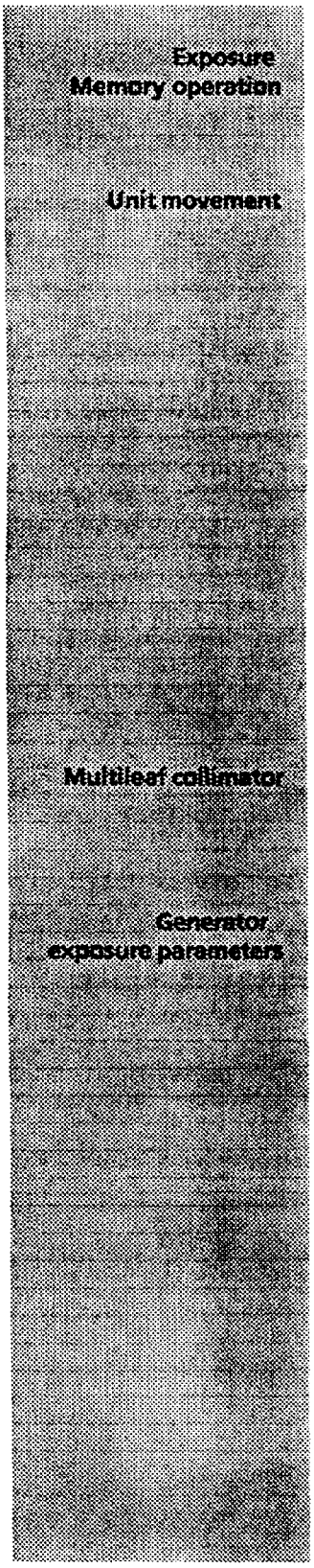
Fluoroscopy

Fluoroscopy 1/2, automatic 1/2
I.I. format selection, automatik stop, image inversion, reset fluoroscopy summer , reset fluoroscopy data and area dose product, displays of fluoroscopy KV, mA, time, area dose product

Memory operation Memory control

LIH, edge enhancement, storage of fluoroscopic image,
Motion detector, K faktor (noise reduction),
A monitor/B monitor
Contrast enhancement A/B, stored image to the monitor
(page down, page up)
Triggering of documentation camera
Changing over between working monitor/memory monitor


STOP
KV
cGyxcm²
mA
min
f/s
KV
max
mA
mAs
mm
DR
M
8°
0,8s
20°
2s
KV
mAs
Limit



Exposure Memory operation

Cassette exposure (film exposure)
Storage shot
(Storage shot offers the same possibilities of manipulation as fluoroscopy).

Unit movement

Excursion range of tabletop
Transverse: 24 cm (-14 cm - + 10 cm)
Longitudinal: 80 cm (-57 cm - + 23 cm)
Upright/tilt: + 88° - 15° (103°)
Lift/lower: 86 cm - 129 cm (43 cm)
Maximum lowering: (only possible in 90° and 0° position)

Tube unit movement
Max. swivel range ± 15°
in patient longitudinal direction and in all tabletop positions.
Working position, park position
Oblique radiation, tomography
Zero position

Tomography
8° and 20° tomographic angle
Tomographic height setting 0 - 20cm

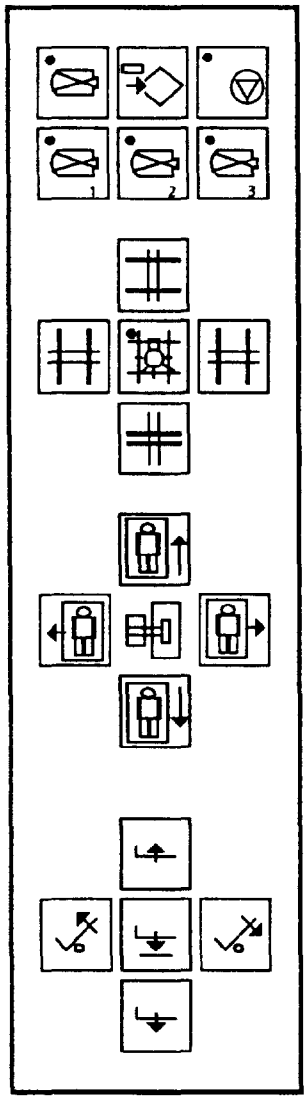
Multileaf collimator

Digital automatic collimator with several modes of operation for formation collimation (semiautomatic, fully automatic).

Generator exposure parameters

Technique selection
Direct technique (spotfilm device cassette exposure)
Indirect technique (fluoroscopy, digital radiography)
Zero-point technique possible in both modes.

Organ program selection
Ten program keys for direct and indirect technique



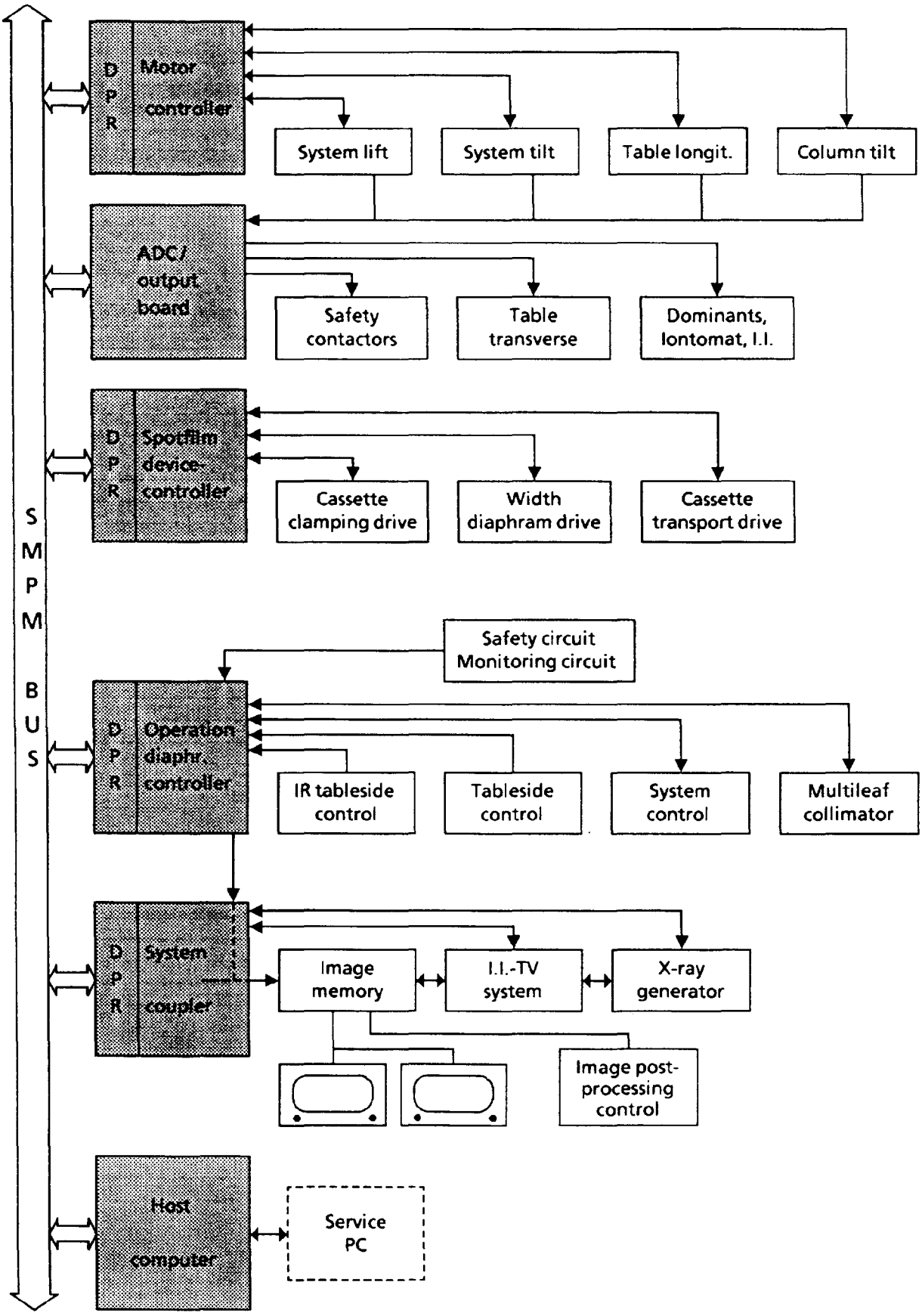
Function groups

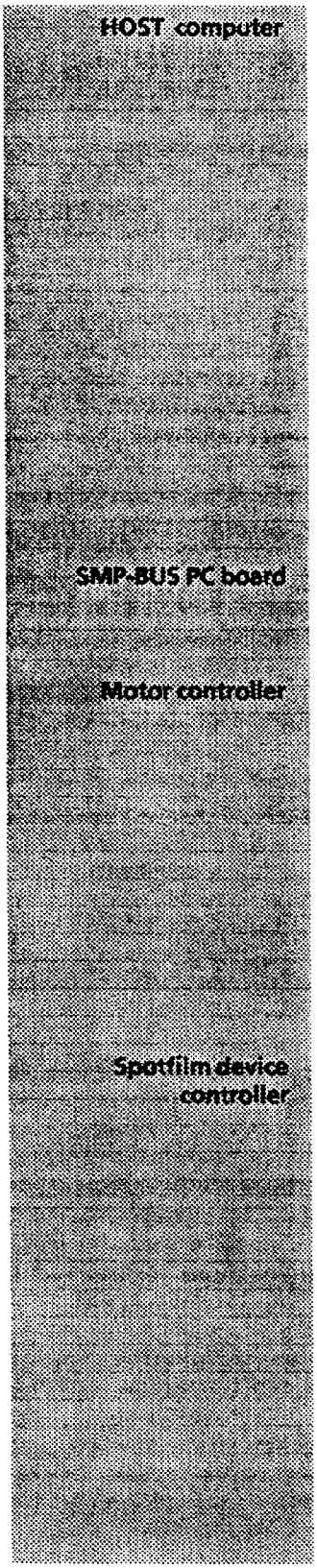
The following function groups can be operated from the tableside control panel:

- Unit movements = Upright / tilt
  = Lift / lower
- Tabletop movements = Longitudinal / transverse
- Multileaf collimator control = Open / close
  = Light localizer on
- Zoom control
- Fluoroscopy automatic stop
- ATB function (image at the touch of a button)

Note

The release button for the unit movements on the system control panel does not need to be actuated .


D P R
Motor controller
System lift
System tilt
Table longit.
Column tilt
ADC/ output board
Safety contactors
Table transverse
Dominants, Iontomat, I.I.
D P R
Spotfilm device-controller
Cassette clamping drive
Width diaphram drive
Cassette transport drive
S M P M B U S
Safety circuit Monitoring circuit
D P R
Operation diaphr. controller
IR tableside control
Tableside control
System control
Multileaf collimator
D P R
System coupler
Image memory
I.I.-TV system
X-ray generator
Image post-processing control
Host computer
Service PC



HOST computer

Microprocessor 80186 with program memory (Flash EPROM) and boot EPROM, watchdog, real-time clock, service interface, Ram, peripheral BUS (SMP-Bus).
The host controls the entire system. It receives the operating requests and status data from the individual components and uses them to determine the necessary actions for the respective system components. The messages are transmitted to the subsystems via parallel and serial interfaces. A serial interface serves for connecting a personal computer, which is used for service and adjustment of the system.
Hardware-controlled watchdog monitoring of the program run, mutual timeout monitoring between host and subsystems. If errors occur in the components, the components are switched off by the host. If a component recognizes a host timeout, it switches to the safe hold condition.
Safety-relevant data are checked for correctness by the host and slaves and the corresponding reactions are initiated (error messages, switching off the component).

SMP-BUS PC board

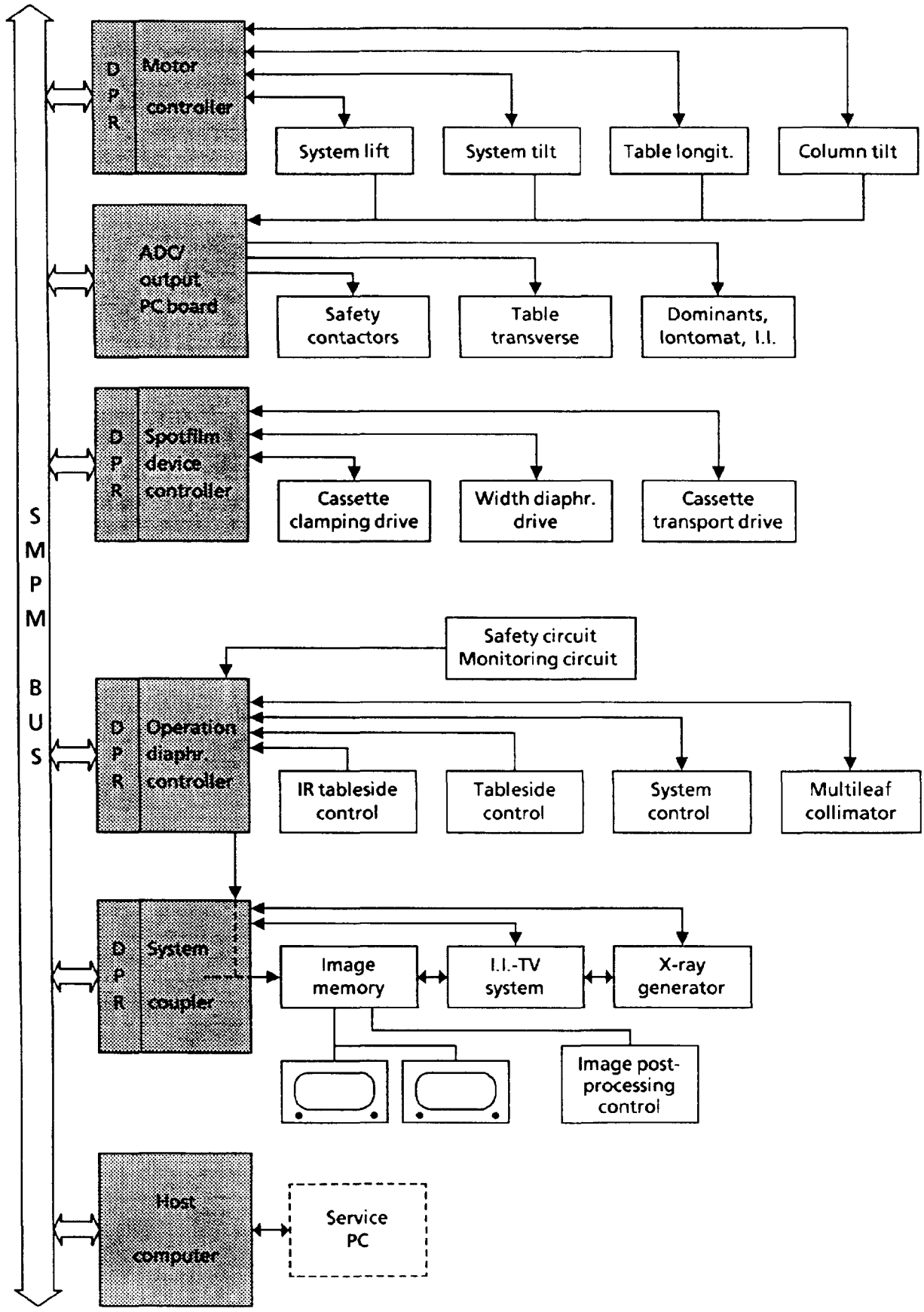
This connects the host to the subsystems via the peripheral bus. Subsystems are for example spotfilm device controller, motor controller, operation/diaphragm controller, A/D converter and system coupler.

Motor controller

Microcontroller SAB8032 with program memory and Dual Port Ram Interface (DPR) to the host. Each drive has its own control component by which it is moved under the control of speed and momentary position to the desired position. The motor controller controls the system lift, system tilt, table longitudinal and column drive.
The processor system is monitored by a watchdog. The maximum and minimum positions are monitored by the respective motor controller. The motor controller signals the current position to the host. The host compares this position with the position of the associated potentiometer and switches the drive off if the deviation between both values becomes too great. The operator can switch the drive off by means of the emergency stop switch.

Spotfilm device controller

Microcontroller SAB 8031 with program memory and Dual Port Ram Interface (DPR) to the host. Each component has its own control component by which it is moved under the control of speed and momentary position to the desired position.
The spotfilm device controller controls the cassette clamping, the cassette transport drive and the drive for the diaphragm plates. The clamping drive serves for clamping the inserted cassette. The transport drive moves the cassette into the exposure, park or unload position. The diaphragm drive positions the diaphragms close to the film according to the position of the multileaf collimator.
The cassette is measured while it is moved into the park position. The host uses the dimensions to calculate the collimation values for the multileaf collimator.
The processor system is monitored with a hardware-controlled watchdog. The maximum and minimum positions are monitored by the respective motor controller. Recognized errors are signalled to the host.


D P R Motor controller
System lift
System tilt
Table longit.
Column tilt
ADC/ output PC board
Safety contactors
Table transverse
Dominants, Iontomat, I.I.
D P R Spotfilm device controller
Cassette clamping drive
Width diaphr. drive
Cassette transport drive
S M P M B U S
Safety circuit Monitoring circuit
D P R Operation diaphr. controller
IR tableside control
Tableside control
System control
Multileaf collimator
D P R System coupler
Image memory
I.I.-TV system
X-ray generator
Image post-processing control
Host computer
Service PC

Operation/diaphragm controller (ODC)

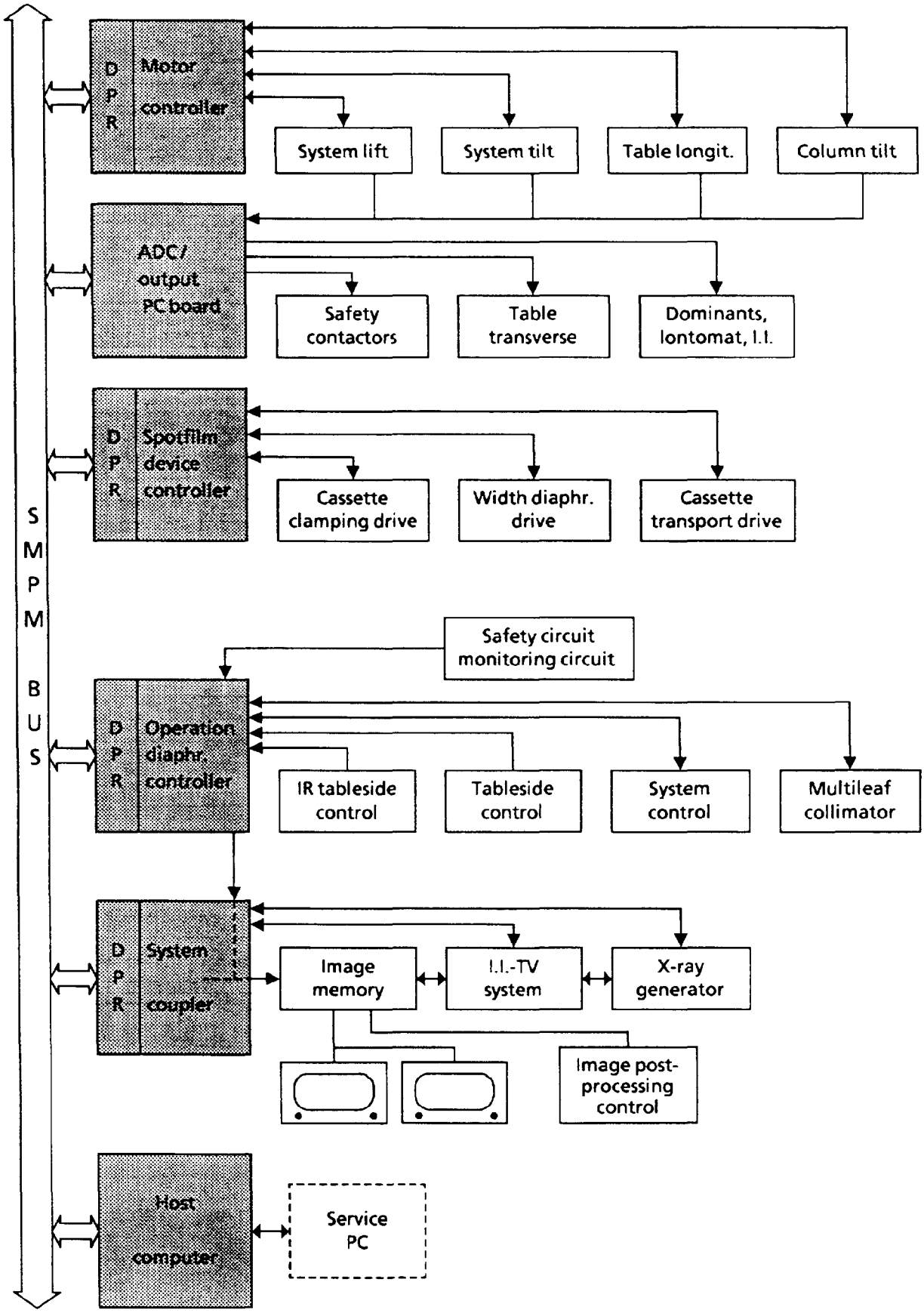
Microcontroller SAB8032 with program memory and Dual Port Ram Interface (DPR) to the host. Serial interface driver with four-wire cable to the multileaf collimator. DUEP (data communications protocol) interfaces with 20mA current loops to the main controls, the tableside control and the image memory.
The operation/diaphragm controller (ODC) establishes the connection between the host and the components such as multileaf collimator, main control console, tableside control and image memory. The serial data of the slaves are converted and transferred to the host. The data transfer between the ODC and the slaves as well as between host and ODC takes place in form of protocols. The controls transmit the corresponding key codes and receive the respective codes for the displays, LEDs and buzzers.
The received and transmitted protocols are checked for length, parity and checksum. The subsystems must address the ODC cyclically. If this does not happen, the timeout of the respective system is signalled to the host. The host then switches the corresponding subsystem requests over to a safe condition and displays the respective error.

System coupler (SC)

Microcontroller SAB8032 with program memory and Dual Port Ram-Interface to the host. Serial interface driver with fiber-optic cable to the generator, 20mA current loops to the synchronization of the image memory and a parallel interface to the TV system. The system coupler establishes the connection to the generator, the I.I./TV system and the image memory. It is connected to the control deck interface of the generator via a fiber-optic cable. The data for the control as well as the control signals (KK signals) are transmitted via this interface. The synchronization of the memory (radiation start to the memory and acquisition from the memory) takes place via static signal lines. The control signals for the I.I./TV system are output parallel by means of a relay. The received and transmitted protocols are checked for length, parity and checksum. The generator must address the system coupler cyclically. If this does not happen, a generator timeout is signalled to the host. The host then switches the corresponding generator requests to a safe condition and displays the respective error.
The acquisition signal of the image memory is monitored with a 50 ms timer to ensure that radiation is switched off safely in case of a fault.

Tableside control

Microcontroller SAB8751 with internal program memory, watchdog and DUEP interface with 20mA current loop to the ODC. The tableside control contains only the most important control elements for the unit and for fluoroscopy. The microcontroller reads in the actuated keys and sends the corresponding key codes to the ODC. From the ODC it receives the codes of the key LEDs to be displayed. If the tableside control is disconnected, the ODC cancels the previously transmitted travel commands.
The received and transmitted protocols are checked for length, parity and checksum. The tableside control must address the ODC cyclically (compare ODC safety).


S M P M B U S
D P R
Motor controller
System lift
System tilt
Table longit.
Column tilt
ADC/ output PC board
Safety contactors
Table transverse
Dominants, Iontomat, I.I.
D P R
Spotfilm device controller
Cassette clamping drive
Width diaphr. drive
Cassette transport drive
Safety circuit monitoring circuit
D P R
Operation diaphr. controller
IR tableside control
Tableside control
System control
Multileaf collimator
D P R
System coupler
Image memory
I.I.-TV system
X-ray generator
Image post-processing control
Host computer
Service PC

System control

Microcontroller SAB 8032 with program memory, watchdog and DUEP interface with 20mA current loop to the operation/diaphragm controller. The generator, the image memory, the I.I./TV system and the unit are operated via the main control. The microcontroller reads in the actuated keys and transmits the corresponding keys codes to the ODC. From the ODC it receives the codes of the key LEDs to be displayed, of the displays and the buzzer. The received and transmitted protocols are checked for length, parity and checksum. The system control must address the ODC cyclically (compare ODC safety).

Image memory

The Memoskop 100 is used, which was developed for Siremobil 2000. In addition to the storage of arbitrary fluoroscopic images (LIH, ATB), digital radiography is possible,too, i.e. Memospot operation with subsequent progressive scan of the exposure.

Operation of the image memory

The image memory is operated via the system control console. The following functions are operated.
- Selection of digital radiography
- Edge enhancement
- Automatic motion detector
- Noise reduction (const.)
- Storage of current image (ATB)
- Paging up and down in the memory (+ /-)
- Monitor switch-over
- Contrast enhancement (LUT)

Image postprocessing control

Directly connected to the image memory.

Connection to the system

Connection to the system via a 20 mA current loop with DUEP protocol to the ODC of the Uroskop D. Operation and parameterization of the image memory takes place via this interface.

Synchronization

Synchronization between image memory and generator takes place via the system coupler. The generator signals the start of radiation to the memory. The memory then starts the image acquisition and signals "aquisition" until the acquisition is completed after the fluoroscopic switch has opened. Only then does the system coupler cancel the fluoroscopy request from the generator.

Generator

Polydoros 80S is used. The function of this generator is explained in the respective documents. Therefore, only functions which deviate from those in the documents are explained here. With digital radiography the Intervent D2 system is operated in Sircam mode and the Intervent D3 system in DSA mode.

Operation

Operation of the generator is integrated in the system control console. The generator has no control deck. The control deck interface of the generator is connected with the Uroskop system coupler via a fiber-optic cable. (continued on next page)

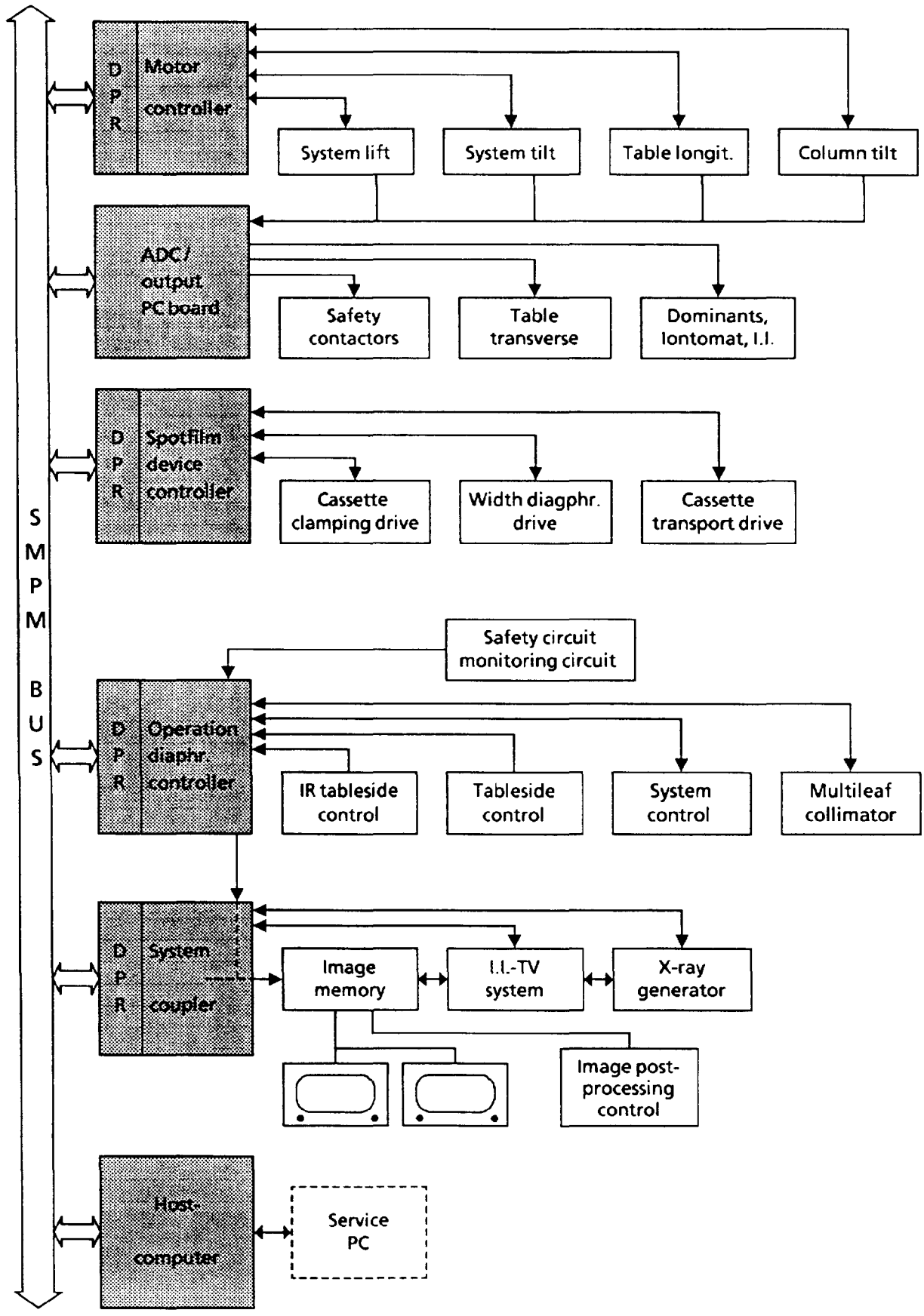

SMPM BUS
D P R
Motor controller
System lift
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Image memory
I.I.-TV system
X-ray generator
Image post-processing control
Host-computer
Service PC

Operation

Via this interface the operating requests are transmitted to the generator and the generator messages (displays, buzzers, errors) are returned to the control console. Control functions which are not relevant for urology have not been implemented.

Generator control (KK signals)

There is no KK interface. The control signals are transmitted from the host to the generator via the system coupler in the same way as the control signals. This is possible since both operating and control signals are available at the DUEP bus of the generator.

Safety

The system coupler and generator monitor one another for timeout. If a component fails, the system automatically switches to the safe operating condition.

Image intensifier/television system

The Sirecon 2 system is used in connection with the Videomed N television system (with Uroskop D2).

Connection to the system

The control signals for the I.I./TV system are output parallel via the system coupler by means of a relay. These are the signals for I.I. format switching, selection of the fluoroscopic dose, progressive scan and the signal for exposure or fluoroscopy to the TV control unit.

Service PC

Connection to the unit: The service PC is connected to the host via the RS 232 interface.

Functions

Parameterization, service and adjustment of the entire system are performed by means of the service PC. The following menu-controlled functions are supported:

- System information (serial numbers, modification levels, version, startup data, service info, etc.)
- Parameterization of the system (drive parameters, system configurations, timeout periods, maximum values for formats etc.)
- Current system status (potentiometer values, cassette size, collimation values of the diaphragms, selected programs, unit positions, etc.)
- Error display in text form (long-time error, short-time error)
- Output of processor data (memory areas, input ports)
- Writing of memory locations or output ports
- Adjustments of potentiometers, format collimations, cassette acquisition
- Test movement for drives

For safety reasons drives cannot be activated directly via the service PC.

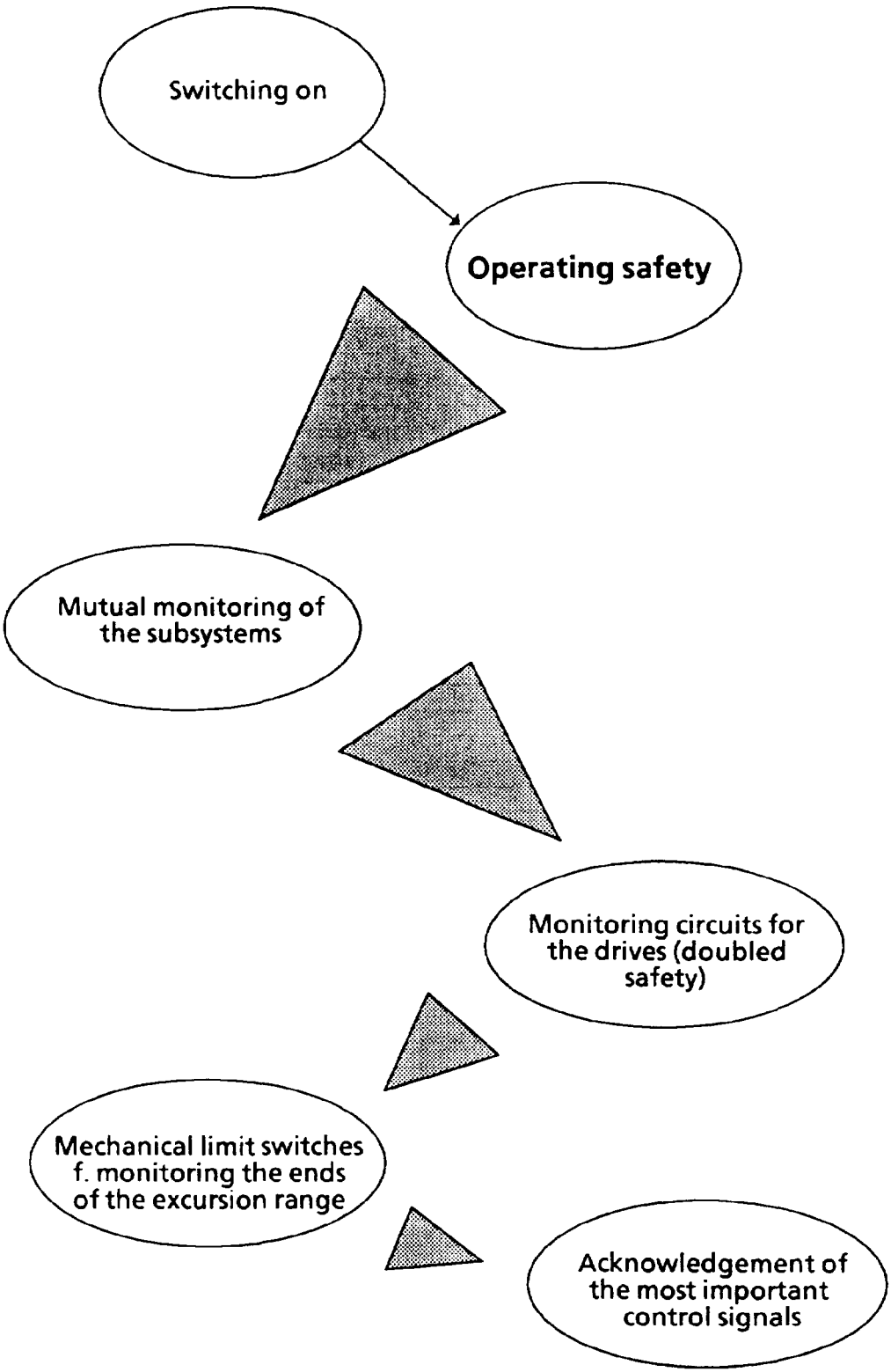
Software

The service software (loaded into the PC memory) is installed in the PC. Only those modules necessary for data transfer and adjustment are contained in the host software.

System run-up

2-2 Operating safety
2-4 Run-up and monitoring elements

CHAPTER 2


Switching on
Operating safety
Mutual monitoring of the subsystems
Monitoring circuits for the drives (doubled safety)
Mechanical limit switches f. monitoring the ends of the excursion range
Acknowledgement of the most important control signals

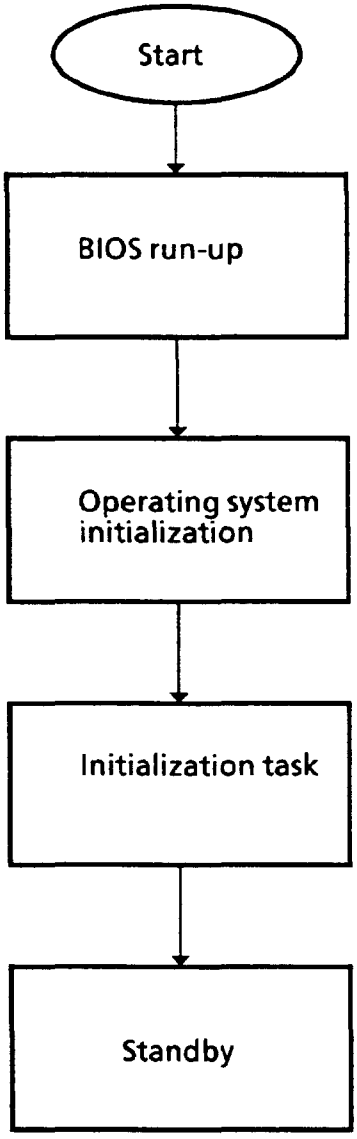
Switching on

After switching on, the system does not carry out any search or synchronization movements with the exception of the spotfilm device drives.
All other components remain in the position they had before the system was switched on.
The same control elements which are enabled during normal system operation with the same system configuration are enabled for operation.

Operating safety

To ensure operating safety, the following mechanisms are integrated in the system.

- The subsystems monitor their functions mutually;
- The movements of the drives are controlled by a control circuit and by a superposed supervising circuit;
- The excursion ranges of all drives are limited by mechanical limit switches, which act on the power supply of the respective drives ;
- An emergency shutdown switch can stop all unit movements;
- Relevant control signals, e.g. for opening and closing contactors to supply the drives with power, are monitored by acknowledgement contacts.


Start
BIOS run-up
Operating system initialization
Initialization task
Standby

Run-up

After <u>switching on the unit</u>
Hardware reset
-› Initialize subsystems
-› Check initial data
-› Start tasks
-› Preallocate dynamic output data
-› Check EEPROM identification

} Run-up tasks

a) Hardware reset
The unit is switched on or reset.

b) BIOS run-up
-› BIOS initializes CPU and performs hardware tests.
-› Normal condition

c) Operating system initialization
-› RMOS initializes CPU, DMA component, interrupt controller
-› starts task TA- Init

d) Initialization task (TA-Init)
-› Comparison of the host software number with that in EERPOM
If number deviates, an error message is displayed → **0 F 0 0**
- Service intervention: Update version number.

-› Call-up of all subsystem initialization routines
-› System set to operating condition (standby).

Safety monitoring

Requirement: doubled safety
Hardware equipment: (limit switches, contactors etc.)
Software safeguarding: for all parts which can be reached from the host.

The following components must be monitored:
- Emergency stop
- Limit switches
- Supply voltages
- Contactors
- A/D converter

Emergency stop

HW safety circuit: Interruption can be recognized by host (port input)
Triggered by emergency shutdown or HW limit switch.

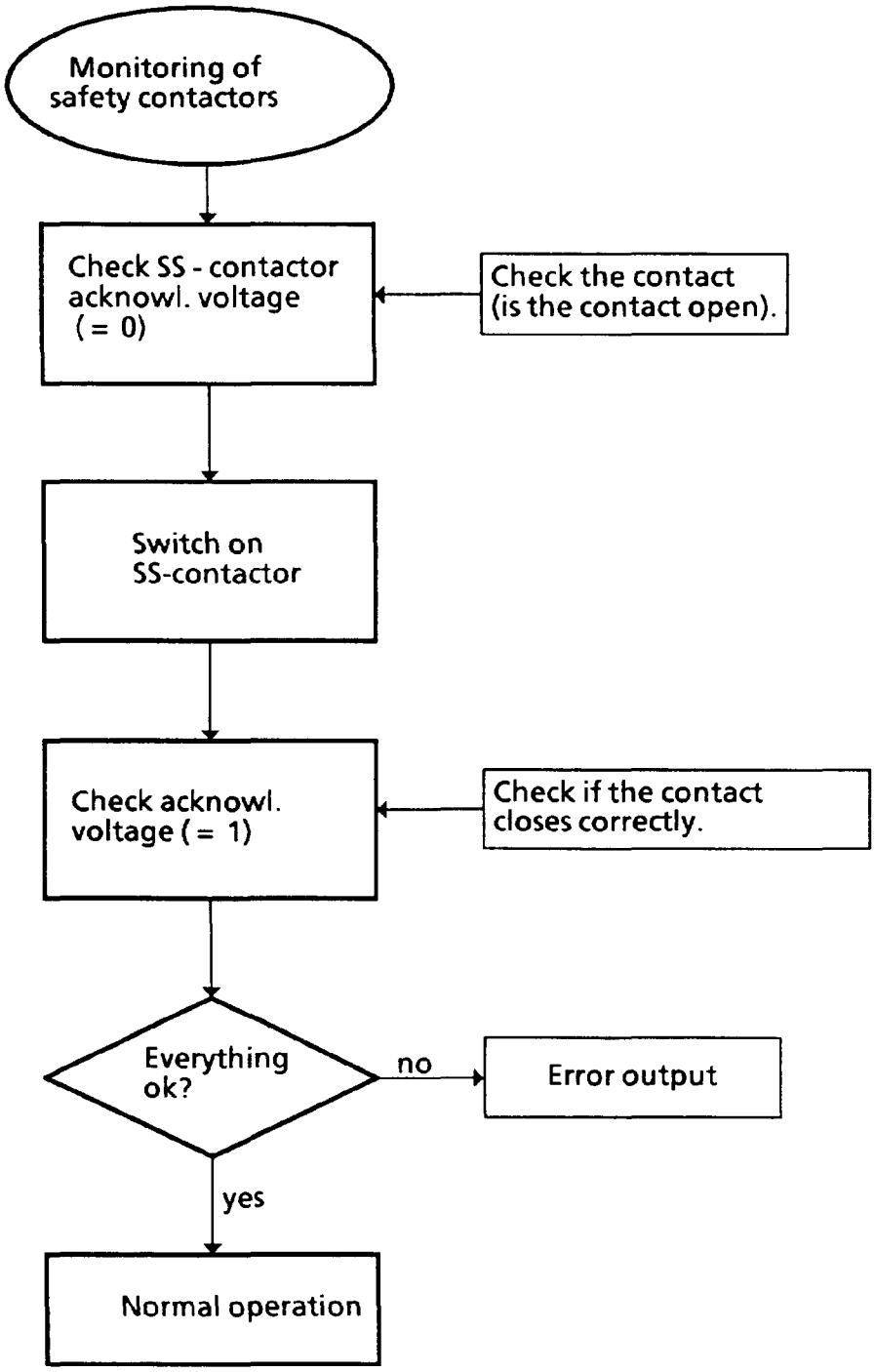
Limit switches

All limit switches can be read in their current position (selection of limit switches can be configured) (max. 2)).

Supply voltages (voltage within nominal range)

- System lift drive
- Spotfilm device drive
- Brake voltage
- Computer power supply
- Table longit.
- Switch voltage
- Contactor control
- System tilt

These voltages are checked by the host.


Monitoring of safety contactors
Check SS - contactor acknowl. voltage (= 0)
Check the contact (is the contact open).
Switch on SS-contactor
Check acknowl. voltage (= 1)
Check if the contact closes correctly.
Everything ok?
no
Error output
yes
Normal operation

Safety contactors

Number can be configured (max. 7) ; presently 2 activated (K1,K2)

Initialization consists of the following phases:

1. Is the main contactor open ? (open!)
2. Checking the contactor for correct opening.
3. Closing the main contactor.
4. Checking the main contactor for correct closing.
5. Enabling spotfilm device run-up and collimator search run.

A/D converter

Number of channels: 8. One reference channel to monitor the A/D converter.

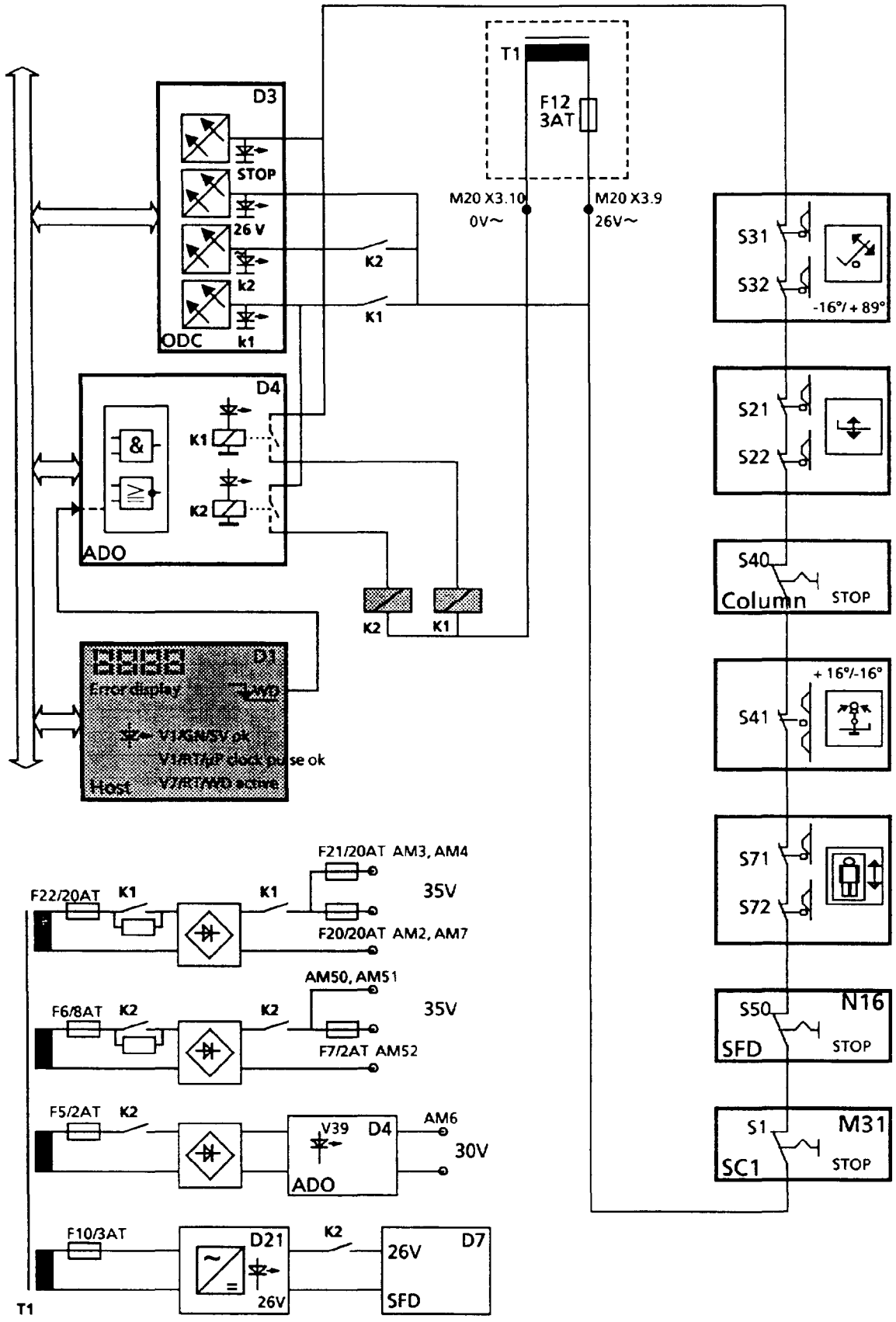
Watchdog

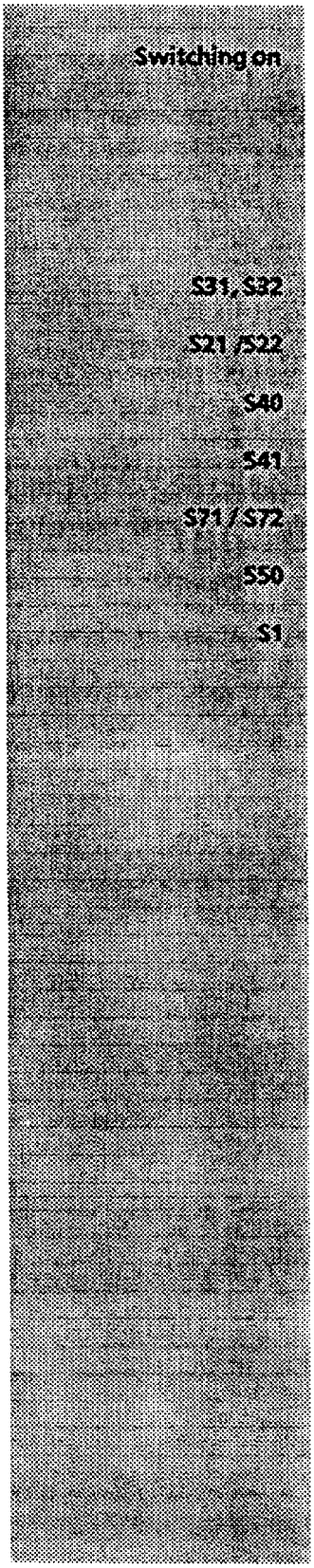
Monitors the software. Intended to lead from a faulty reaction to a defined end reaction.
Function:
A counter starts together with the software. It is continuously reset by the program. If the software run is disturbed (stops or jumps into incorrect routine), the counter reaches its programmed limit value. This triggers the so-called WATCHDOG signal.
An NMI (non maskable interrupt) starts -‣ **Restart of system required.**

Safety circuit

3-2 Survey

CHAPTER 3


T1
F12
3AT
M20 X3.10
0V~
M20 X3.9
26V~
D3
STOP
26 V
k2
ODC
k1
K2
K1
D4
K1
K2
ADO
K2
K1
D1
Error display
V1/GN/SV ok
V1/RT/µP clock pulse ok
Host
V7/RT/WD active
S31
S32
-16°/+89°
S21
S22
S40
Column
STOP
+16°/-16°
S41
S71
S72
S50
N16
SFD
STOP
S1
M31
SC1
STOP
F21/20AT AM3, AM4
F22/20AT
K1
K1
35V
F20/20AT AM2, AM7
AM50, AM51
F6/8AT
K2
K2
35V
F7/2AT AM52
F5/2AT
K2
V39
D4
AM6
30V
ADO
F10/3AT
D21
K2
D7
26V
SFD
26V
T1



During the switch-on phase the host (D1) checks the safety relays K1 and K2.
By means of the ADO (D4) the host controls K1 and K2 via the WD output. The ODC (D3) checks if the relays are closed or open. If one of the contacts is sticking or burnt, the run-up and initialization phase is interrupted and an error message is output. See host error list.

Unit tilting/ setting upright: movement range - 88° / + 15°

Table lifting/lowering

Emergency stop column

Column swivelling: movement range + 15°/-15°

Table longitudinal movement

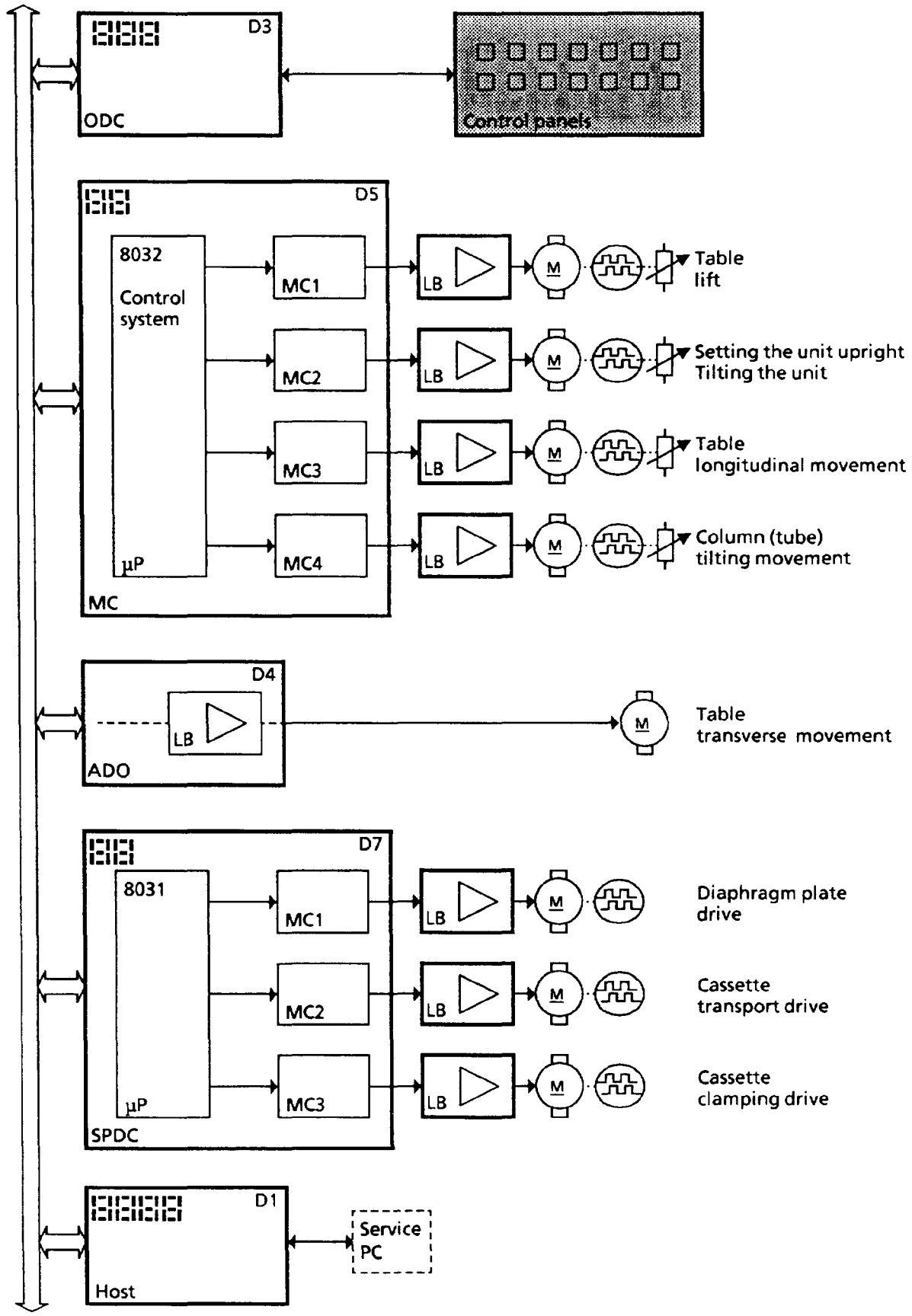
Spotfilm device emergency stop

Control panel emergency stop

Motor control

Introduction	4-2
Unit uprighting/tilting	4-4
Table lift	4-6
Column tilting movement	4-8
Table longitudinal movement	4-10
Table transverse movement	4-12
Cassette clamping drive	4-14
Cassette transport drive	4-16
Diaphragm plate drive	4-18

CHAPTER 4


D3
ODC
Control panels
D5
8032
Control system
µP
MC
MC1
MC2
MC3
MC4
LB
M
Table lift
Setting the unit upright
Tilting the unit
Table longitudinal movement
Column (tube) tilting movement
D4
ADO
Table transverse movement
D7
8031
SPDC
Diaphragm plate drive
Cassette transport drive
Cassette clamping drive
D1
Host
Service PC

General

The motor control consists of:
- Motor controller MC D5
- Motor power stages (LB)
- Spotfilm device controller SFDC

Motor controller D5 (MC)

D5 controls four drives:

- Table lift
- Tilting unit/setting unit upright
- Table longitudinal movement
- Column (tube) tilting movement

Motor end phase in the ADC(D4)

This controls the motor for the table transverse movement and receives control signals directly from the host PC board D1.

Spotfilm device controller D7

D7 controls three drives:

- Diaphragm plate drive
- Cassette transport drive
- Cassette clamping drive

Monitoring

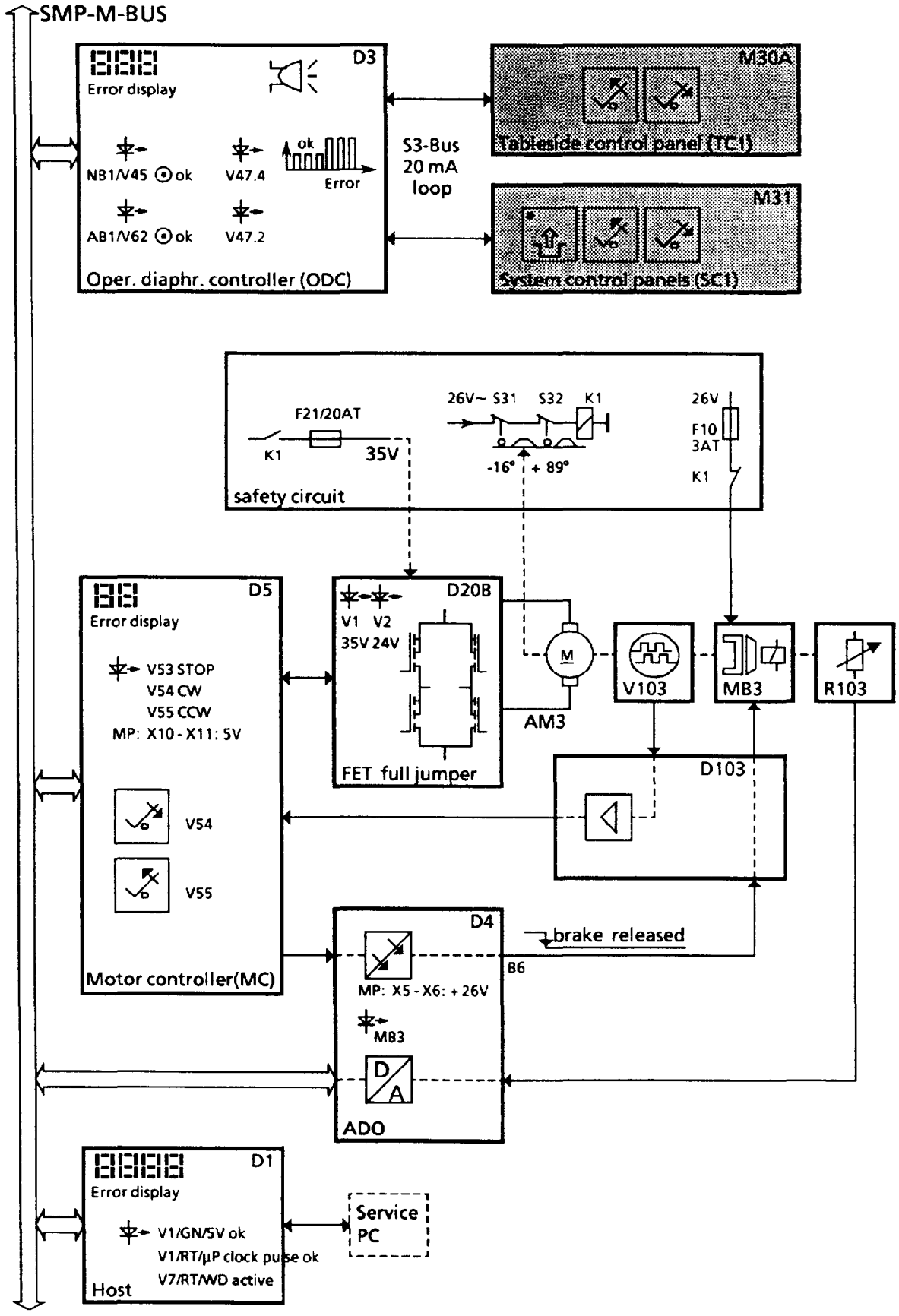
The encoders and potentiometers, which are mechanically connected to the motor shafts, send the actual position of the drives to the monitoring units.

Service PC

The service PC is used for the following tasks:
(only the most important ones are listed).

- Loading the software
- Execution of the service program
- Adjustments
- Trouble-shooting

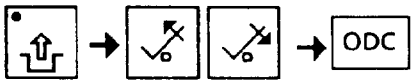
etc.


SMP-M-BUS
D3
Error display
NB1/V45 ok
V47.4
ok
Error
AB1/V62 ok
V47.2
Oper. diaphr. controller (ODC)
S3-Bus
20 mA
loop
M30A
Tableside control panel (TC1)
M31
System control panels (SC1)
F21/20AT
K1
35V
26V~ S31
S32
K1
-16°
+ 89°
26V
F10
3AT
K1
safety circuit
D5
Error display
V53 STOP
V54 CW
V55 CCW
MP: X10 - X11: 5V
V54
V55
Motor controller(MC)
D20B
V1 V2
35V 24V
FET full jumper
M
AM3
V103
MB3
R103
D103
D4
brake released
B6
MP: X5 - X6: + 26V
MB3
D/A
ADO
D1
Error display
V1/GN/5V ok
V1/RT/µP clock pulse ok
V7/RT/WD active
Host
Service
PC

Display	Reaction
V 47.4	flickers and lights up with low brightness
V47.2	→ data transfer ok flickers and lights up very brightly → data transfer faulty
V45/D3	LED on
V62/D3	→ data transfer ok LED off → Data transfer faulty
V53/D5	LED ein: Motor stop
V54/D5	LED ein: Motor tilting activated
V55/D5	LED ein: Motor uprighting activated
V1/D1	LED ein: Processor clock pulse faulty
V7/D1	LED ein: Watchdog has responded (software fault)

Travel command

If a key is actuated on the control panel, the ODC receives a travel command (TrC) request.

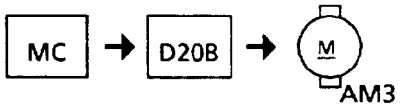


Is the travel command valid?

The travel command is transmitted to the host via dual port RAM. The host checks if this travel command is valid and transfers it to the motor controller (MC).

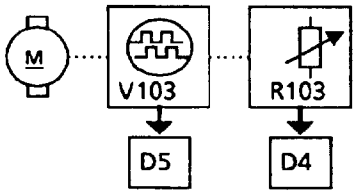
Motor control

The MC controls power stage D20B and thus motor AM3. The motor voltage is pulse-width modulated.



Motor control and actual position

By means of the encoders the D5 controls the rotational speed and sends the current relative position to the host PC board D1.
The host can acquire the current absolute position via the A/D converter D4 with potentiometer R103.



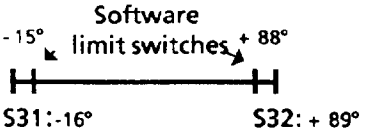
Actual value comparison

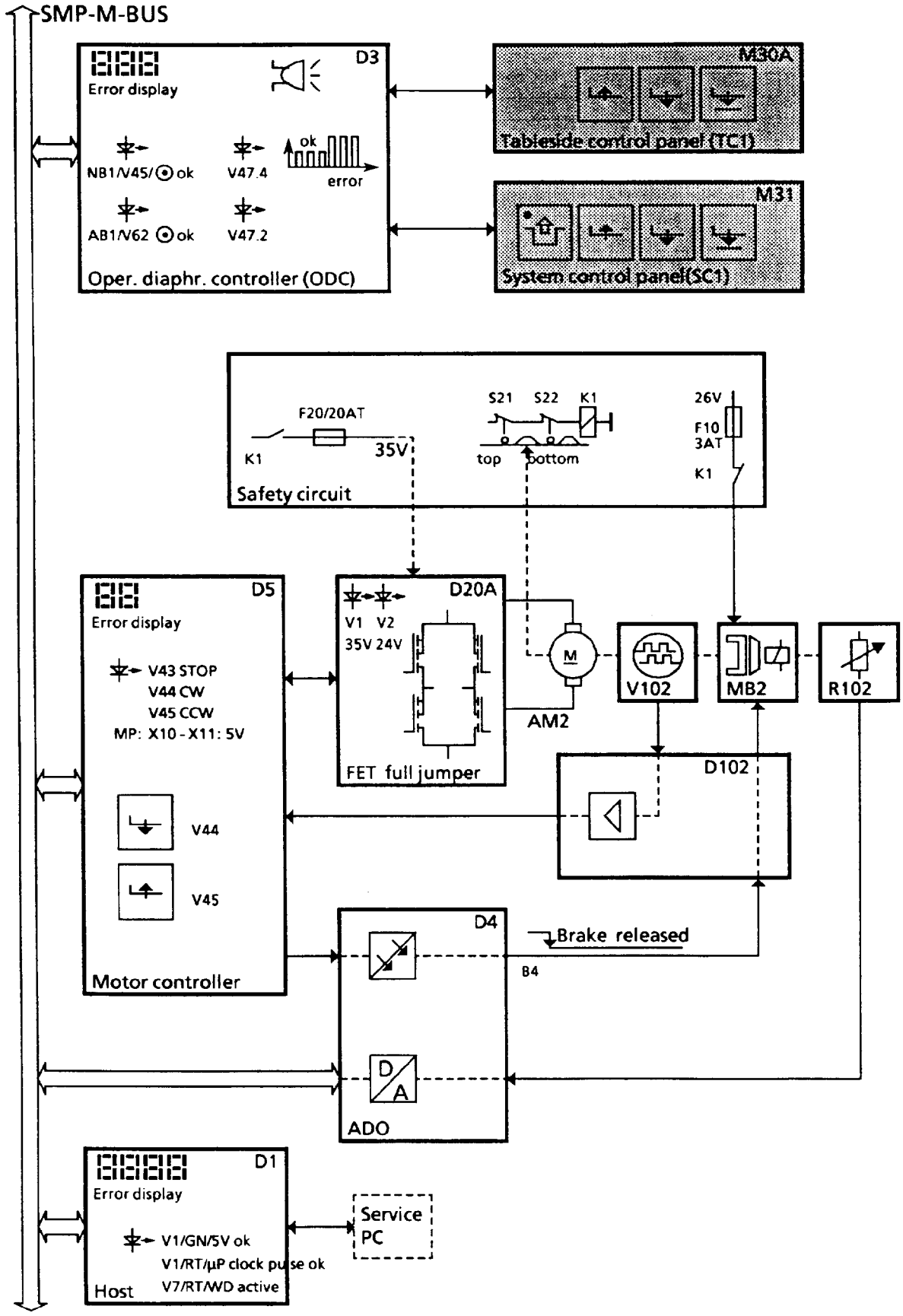
The host compares the two actual positions and outputs an error message if the permissible tolerance values are exceeded.

act.pos. R 103 = act.pos. V 103 ?

End of excursion range

The end of the excursion range is monitored by software limit switches. In case of an error, safety limit switches switch off the operating voltage for the motor (S31, S32).

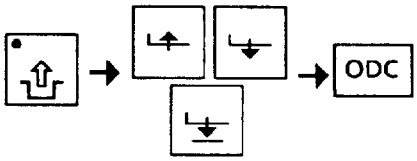



SMP-M-BUS
D3
Error display
NB1/V45/ ok
V47.4
ok
error
AB1/V62 ok
V47.2
Oper. diaphr. controller (ODC)
M30A
Tableside control panel (TC1)
M31
System control panel(SC1)
F20/20AT
K1
35V
S21
S22
K1
top
bottom
26V
F10
3AT
K1
Safety circuit
D5
Error display
V43 STOP
V44 CW
V45 CCW
MP: X10 - X11: 5V
V44
V45
Motor controller
D20A
V1 V2
35V 24V
FET full jumper
M
AM2
V102
MB2
R102
D102
D4
Brake released
B4
D/A
ADO
D1
Error display
V1/GN/5V ok
V1/RT/µP clock pulse ok
V7/RT/WD active
Host
Service
PC

Display	Reaction
V 47.4	flickers and lights up with low brightness
V47.2	→ Data transfer ok
	flickers and lights up very brightly
	→ Data transfer faulty
V45/D3	LED on
V62/D3	→ Data transfer ok
	LED off
	→ Data transfer faulty
V43/D5	LED ein: Motor stop
V44/D5	LED ein: Motor table downwards activated
V45/D5	LED ein: Motor table upwards activated
V1/D1	LED ein: Processor clock pulse faulty
V7/D1	LED ein: Watchdog has responded (software error)

Travel command

If a key is actuated on the control panel, the ODC receives a travel command request.

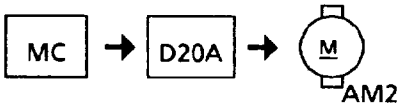


Is the travel command valid?

The travel command is transmitted to the host via dual port RAM. The host checks if this travel command is valid and transfers it to the motor controller (MC)

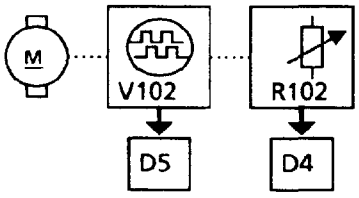
Motor control

The MC controls power stage D20A and thus motor AM2. The motor voltage is pulse-width modulated.



Motor control and actual position

By means of the encoder the D5 controls the rotational speed and sends the relative current position to the host PC board D1.
The absolute current positon can be acquired by the host via the A/D converter D4 with potentiometer R10.2



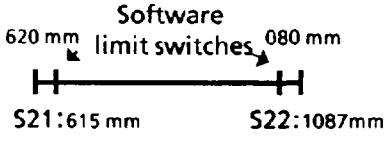
Actual value comparison

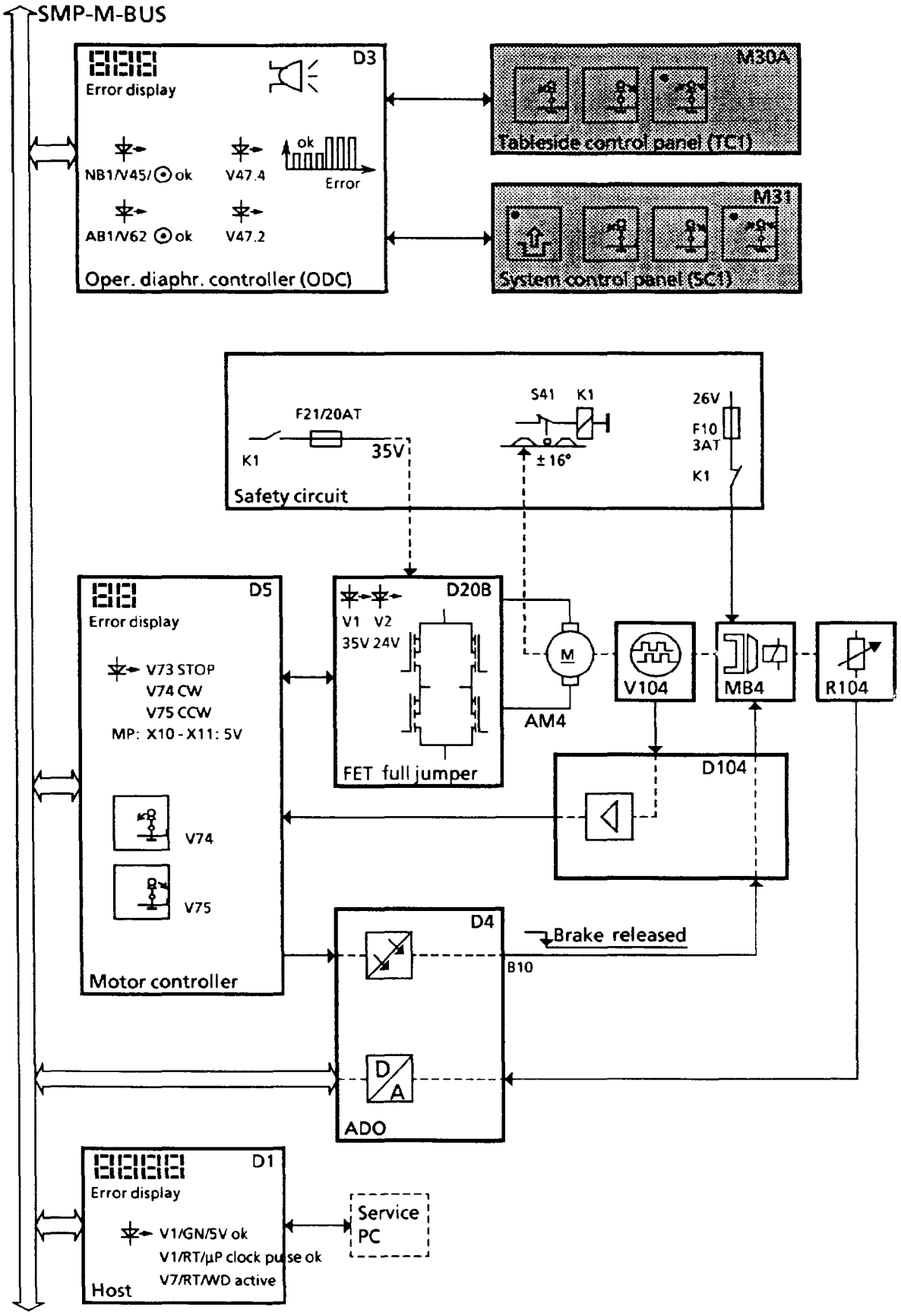
The host compares the two actual positions and outputs an error message if the permissible tolerance is exceeded.

act.pos. R 102 = act.pos. V 102 ?

End of excursion range

The end of the excursion range is monitored by software limit switches. In case of an error, safety limit switches switch off the operating voltage for the motor (S21,S22).

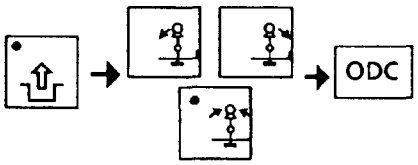



SMP-M-BUS
D3
Error display
NB1/V45/ ok
V47.4
ok
Error
AB1/V62 ok
V47.2
Oper. diaphr. controller (ODC)
M30A
Tableside control panel (TC1)
M31
System control panel (SC1)
F21/20AT
K1
35V
S41
K1
± 16°
26V
F10
3AT
K1
Safety circuit
D5
Error display
V73 STOP
V74 CW
V75 CCW
MP: X10 - X11: 5V
V74
V75
Motor controller
D20B
V1 V2
35V 24V
FET full jumper
M
AM4
V104
MB4
R104
D104
D4
Brake released
B10
D/A
ADO
D1
Error display
V1/GN/5V ok
V1/RT/µP clock pulse ok
V7/RT/WD active
Host
Service
PC

Display	Reaction
V 47.4	flickers and lights up with low brightness
V47.2	→ Data transfer ok
	flickers and lights up very brightly
	→ Data transfer faulty
V45	LED on
V62	→ Data transfer ok
	LED off
	→ Data transfer faulty
V73	LED on: Motor stop
V74	LED on: Motor column tilts to the right
V75	LED on: Motor column tilts to the left
V1/D1	LED on: Processor clock pulse faulty
V7/D1	LED on: Watchdog has responded (software fault)

Travel command

If a key is actuated on the control panel, the **ODC** receives a travel command request.

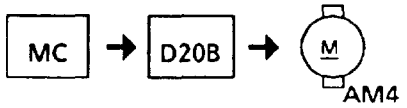


Is the travel command valid?

The travel command is transmitted to the host via dual port RAM. The host checks if this travel command is valid and transfers it to the motor controller (MC).

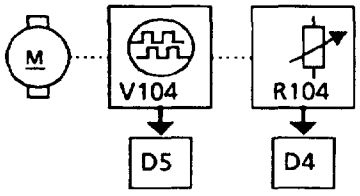
Motor control

The MC controls power stage D20B and thus motor AM3. The motor voltage is pulse-width modulated.



Motor control and actual position

By means of the encoder the D5 controls the rotational speed and sends the relative current position to the host PC board D1.
The absolute current positon can be acquired by the host via the A/D converter D4 with potentiometer R102.



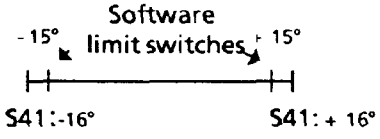
Actual value comparison

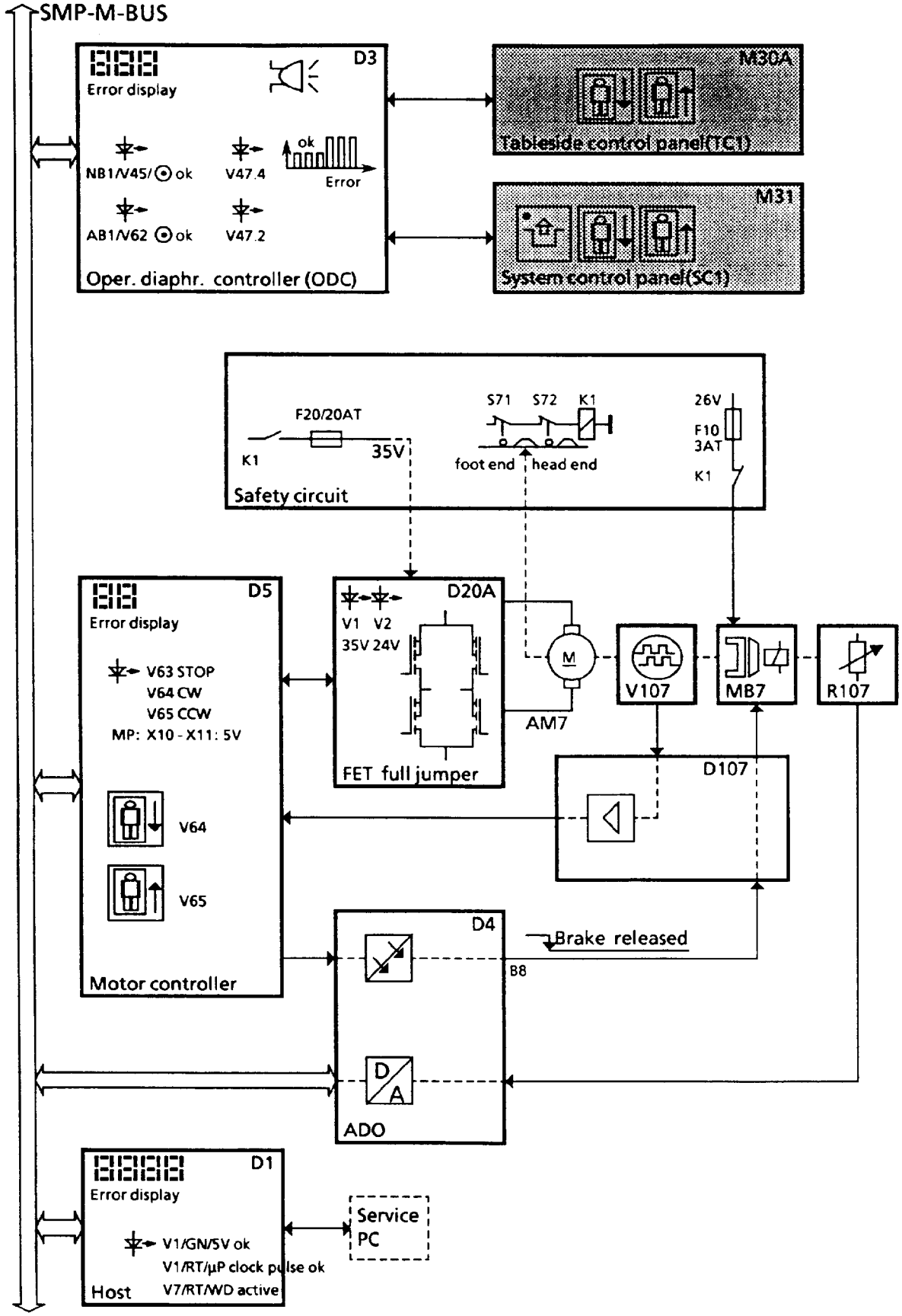
The host compares the two actual positions and outputs an error message if the permissible tolerance is exceeded.

act.pos. R 104 = act.pos. V 104 ?

End of excursion range

The end of the excursion range is monitored by software limit switches. In case of an error, safety limit switches switch off the operating voltage for the motor (S41).

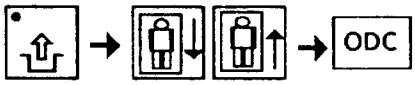



SMP-M-BUS
D3
Error display
NB1/V45/ ok
V47.4
ok
Error
AB1/V62 ok
V47.2
Oper. diaphr. controller (ODC)
M30A
Tableside control panel(TC1)
M31
System control panel(SC1)
F20/20AT
K1
35V
S71
S72
K1
foot end
head end
26V
F10
3AT
K1
Safety circuit
D5
Error display
V63 STOP
V64 CW
V65 CCW
MP: X10 - X11: 5V
V64
V65
Motor controller
D20A
V1 V2
35V 24V
FET full jumper
M
AM7
V107
MB7
R107
D107
D4
Brake released
B8
D/A
ADO
D1
Error display
V1/GN/5V ok
V1/RT/µP clock pulse ok
V7/RT/WD active
Host
Service
PC

Display	Reaction
V 47.4	flickers and lights up with low brightness
V47.2	→ Data transfer ok
	flickers and lights up very brightly
	→ Data transfer faulty
V45/D3	LED on
V62/D3	→ Data transfer ok
	LED off
	→ Data transfer faulty
V63/D5	LED ein: Motor stop
V64/D5	LED ein: Motor footwards activated
V65/D5	LED ein: Motor headwards activated
V1/D1	LED ein: Processor clock pulse faulty
V7/D1	LED ein: Watchdog has responded (software fault)

Travel command

If a key is actuated on the control panel, the **ODC** receives a travel command request.

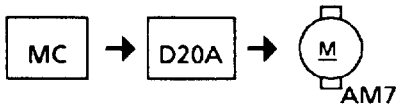


Is the travel command valid?

The travel command is transmitted to the host via dual port RAM. The host checks if this travel command is valid and transfers it to the motor controller (MC).

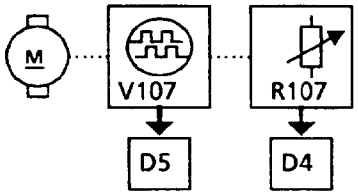
Motor control

The MC controls power stage D20A and thus motor AM7. The motor voltage is pulse-width modulated.



Motor control and actual position

By means of the encoder the D5 controls the rotational speed and sends the relative current position to the host PC board D1.
The absolute current positon can be acquired by the host via the A/D converter D4 with potentiometer R103.



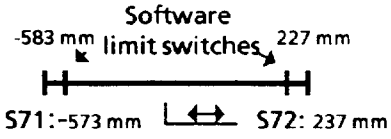
Actual value comparison

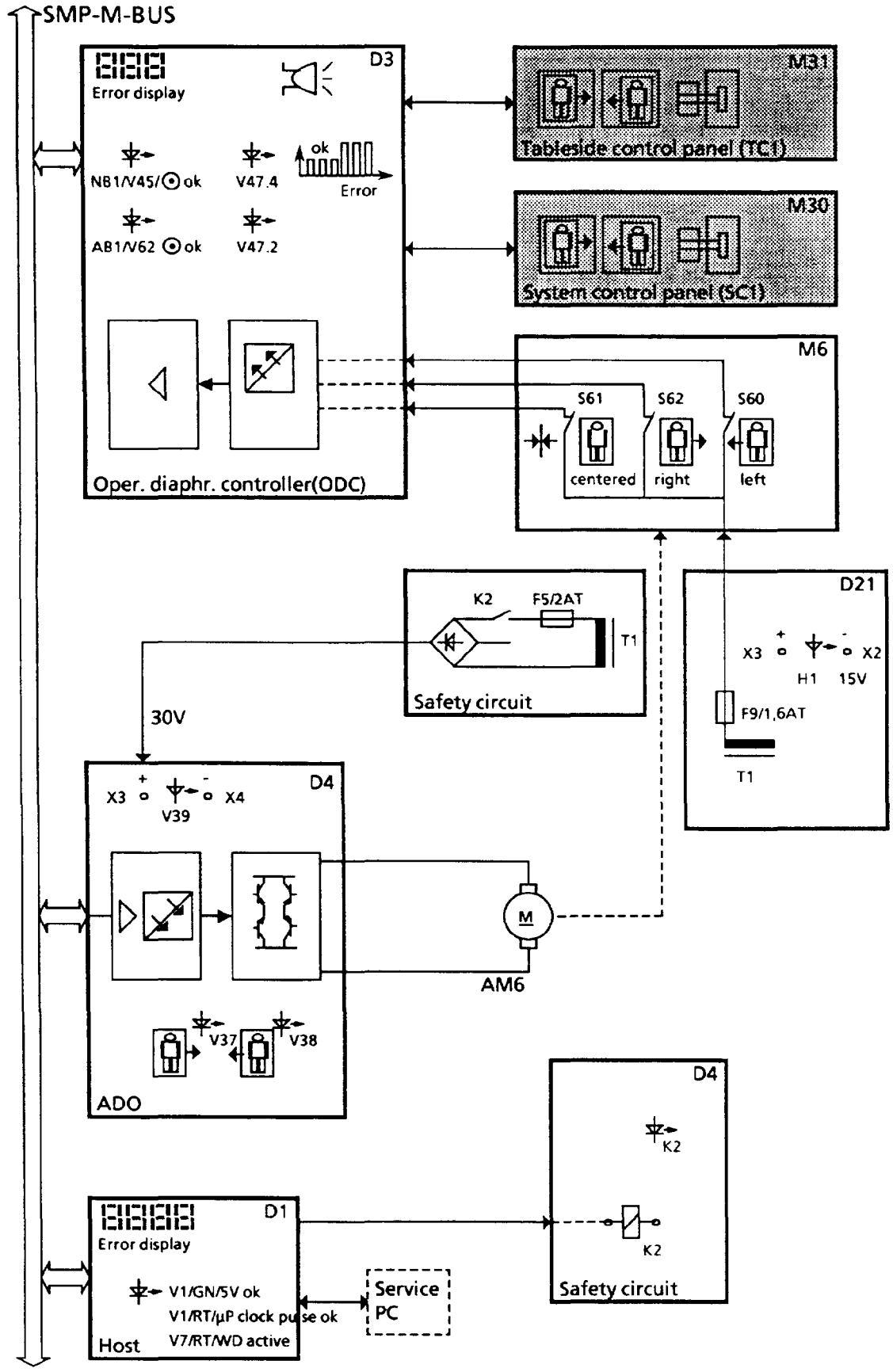
The host compares the two actual positions and outputs an error message if the permissible tolerance is exceeded.

act.pos. R 107 = act.pos. V 107 ?

End of excursion range

The end of the excursion range is monitored by software limit switches. In case of an error safety limit switches switch off the operating voltage for the motor (S71,S72).

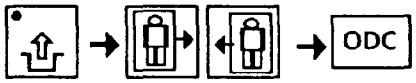



SMP-M-BUS
D3
Error display
NB1/V45/ ok
V47.4
ok
Error
AB1/V62 ok
V47.2
Oper. diaphr. controller(ODC)
M31
Tableside control panel (TC1)
M30
System control panel (SC1)
M6
S61
S62
S60
centered
right
left
K2
F5/2AT
T1
Safety circuit
D21
X3
X2
H1
15V
F9/1,6AT
T1
30V
D4
X3
X4
V39
M
AM6
V37
V38
ADO
D4
K2
K2
Safety circuit
D1
Error display
V1/GN/5V ok
V1/RT/µP clock pulse ok
V7/RT/WD active
Host
Service
PC

Display	Reaction
V 47.4	flickers and lights up with low brightness
V47.2	→ Data transfer ok
	flickers and lights up very brightly
	→ Data transfer faulty
V45/D3	LED on
V62/D3	→ Data transfer ok
	LED off
	→ Data transfer faulty
V37/D4	LED on: Table transverse right activated
V38/D4	LED on: Table transverse left activated
V1/D1	LED on: Processor clock pulse faulty
V7/D1	LED on: Watchdog has responded (software fault)

Travel command

If a key is actuated on the control panel, the **ODC** receives a travel command request.

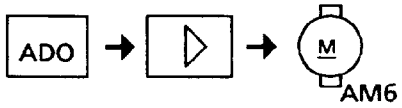


Is the travel command valid?

The travel command is transmitted to the host via dual port RAM. The host checks if this travel command is valid and controls motor AM6 with 30 V dc via the power stage on D4 (ADO).

End of excursion range

The end of the excursion range is monitored by hardware limit switches (S60, S62).

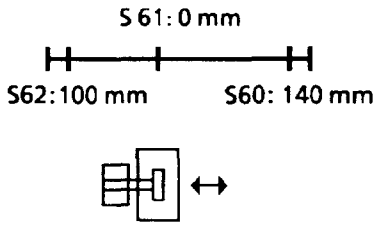


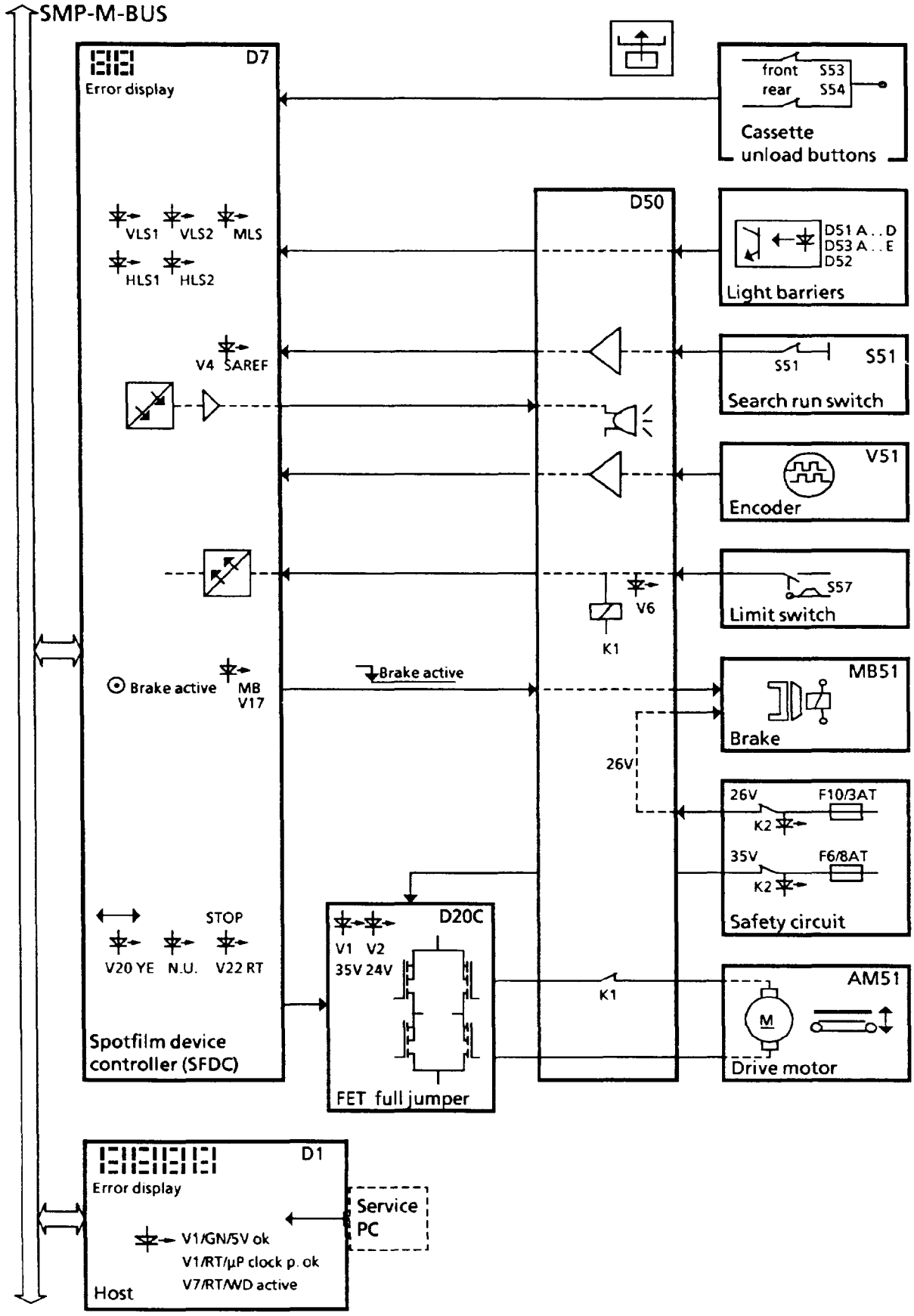
Position monitoring

The positions are not monitored during travelling.

0-position

Upon reaching the center switch S61, the host (D1) stops the movement and waits for repeated activation of the key in the control panel.

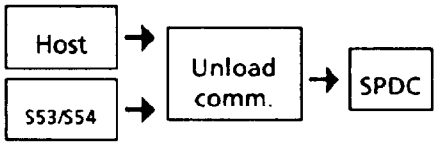



SMP-M-BUS
D7
Error display
front S53
rear S54
Cassette unload buttons
D50
VLS1 VLS2 MLS
HLS1 HLS2
D51 A..D
D53 A..E
D52
Light barriers
V4 SAREF
S51
S51
Search run switch
V51
Encoder
S57
Limit switch
V6
K1
Brake active
MB
V17
Brake active
MB51
Brake
26V
26V
F10/3AT
K2
35V
F6/8AT
K2
Safety circuit
STOP
V20 YE N.U. V22 RT
D20C
V1 V2
35V 24V
K1
AM51
M
Drive motor
Spotfilm device controller (SFDC)
FET full jumper
D1
Error display
Service PC
V1/GN/5V ok
V1/RT/µP clock p. ok
V7/RT/WD active
Host

Display	Reaction	
VLS 1/2	LED on:	Front light barrier 1/2 interrupted
HLS 1/2	"	Rear light barrier 1/2 interrupted
MLS	"	Center light barrier interrupted
V1/D1	LED on:	Processor clock pulse faulty
V7/D1	LED on:	Watchdog has responded (software fault)
V4/D7	LED on:	Search run switch (SAREF) actuated
V20/D7	LED on:	Motor clamping jaws open actiated
V22/D7	LED on:	Motor stop
V6/D50	LED on:	Limit switch S57 closed

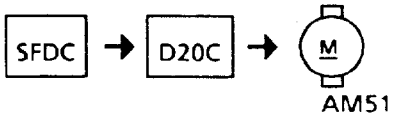
Unload command

The spotfilm device controller (SFDC) receives an unload command from the host (D1) or if an unload button is actuated on the spotfilm device.



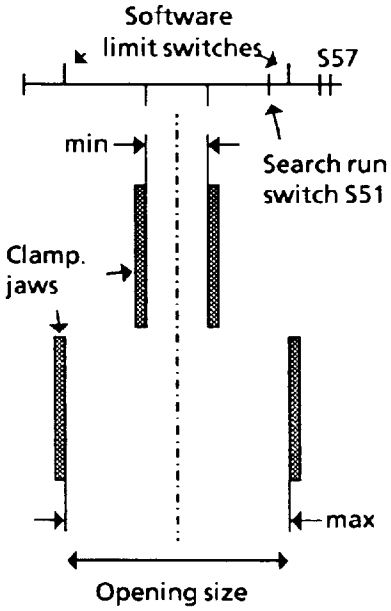
Motor control

The spotfilm device controls power stage D20C and thus motor AM51. The motor voltage is pulse width modulated.



Motor control and opening of clamping jaws

D7 controls the rotational speed with encoder V51 and determines the opening size of the clamping jaws (cassette size) by counting the encoder pulses. A relative zero point can be determined by means of a search run. This search takes place every time a cassette is removed or after a reset (D1 or On/Off).

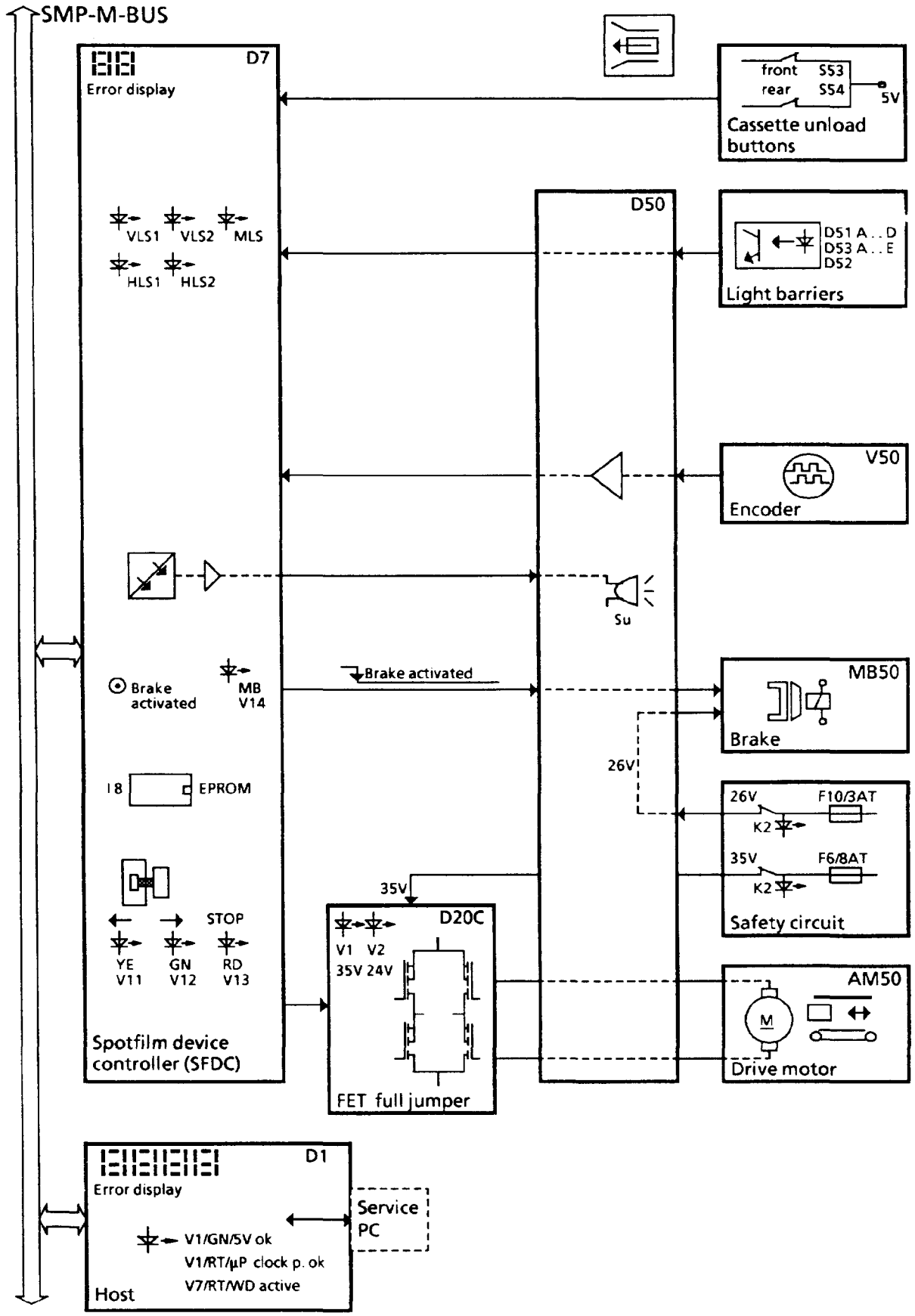


End of excursion range

The end of the excursion range is monitored by software limit switches (maximum and minimum opening size).
The maximum opening of the clamping jaws is ensured by limit switch S57.

Note

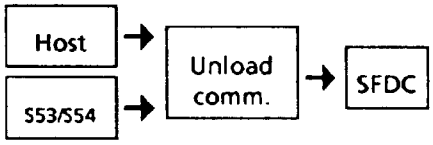
The setting is made with the service PC.


SMP-M-BUS
D7
Error display
VLS1
VLS2
MLS
HLS1
HLS2
front S53
rear S54
5V
Cassette unload buttons
D50
D51 A..D
D53 A..E
D52
Light barriers
V50
Encoder
Su
Brake activated
MB
V14
Brake activated
MB50
Brake
26V
I 8
EPROM
26V
F10/3AT
K2
35V
F6/8AT
K2
Safety circuit
35V
D20C
V1 V2
35V 24V
FET full jumper
STOP
YE
V11
GN
V12
RD
V13
Spotfilm device controller (SFDC)
AM50
M
Drive motor
D1
Error display
Service PC
V1/GN/5V ok
V1/RT/µP clock p. ok
V7/RT/WD active
Host

Display		Reaction
VLS 1/2	LED on:	Front light barrier 1/2 interrupted
HLS 1/2	"	Rear light barrier 1/2 interrupted
MLS	"	Center light barrier interrupted
V1/D1	LED on:	Processor clock pulse faulty
V7/D1	LED on:	Watchdog has responded (softwar fault)
V4/D7	LED on:	Search run switch (SAREF) actuated
V11/D7	LED on:	Cassette transport towards the front
V12/D7	LED on:	Cassette transport towards the rear
V13/D7	LED on:	Motor stop
V14/D7	LED on:	Brake active

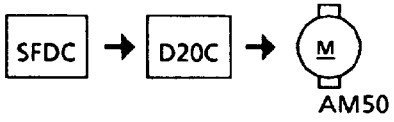
Unload command

The spotfilm device controller (SGDC) receives an unload command from the host (D1) or if an unload button is actuated on the spotfilm device (SFD).



Motor control

The spotfilm device controls power stage D20C and thus motor AM50. The cassette is transported to the front or rear loading shaft. The motor voltage is pulse width modulated.

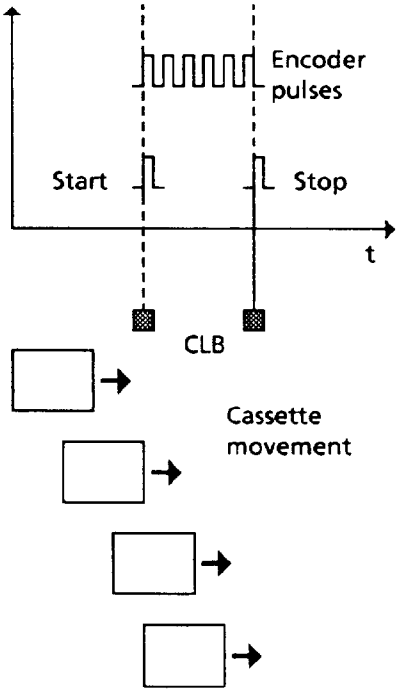


Motor control and cassette transport

D7 controls the rotational speed with encoder V50 and determines the cassette position by counting the encoder pulses and the signals from the light barriers.

Cassette width measurement

The cassette width is measured by means of the center light barrier (CLB) and by counting the encoder pulses (see sketch).

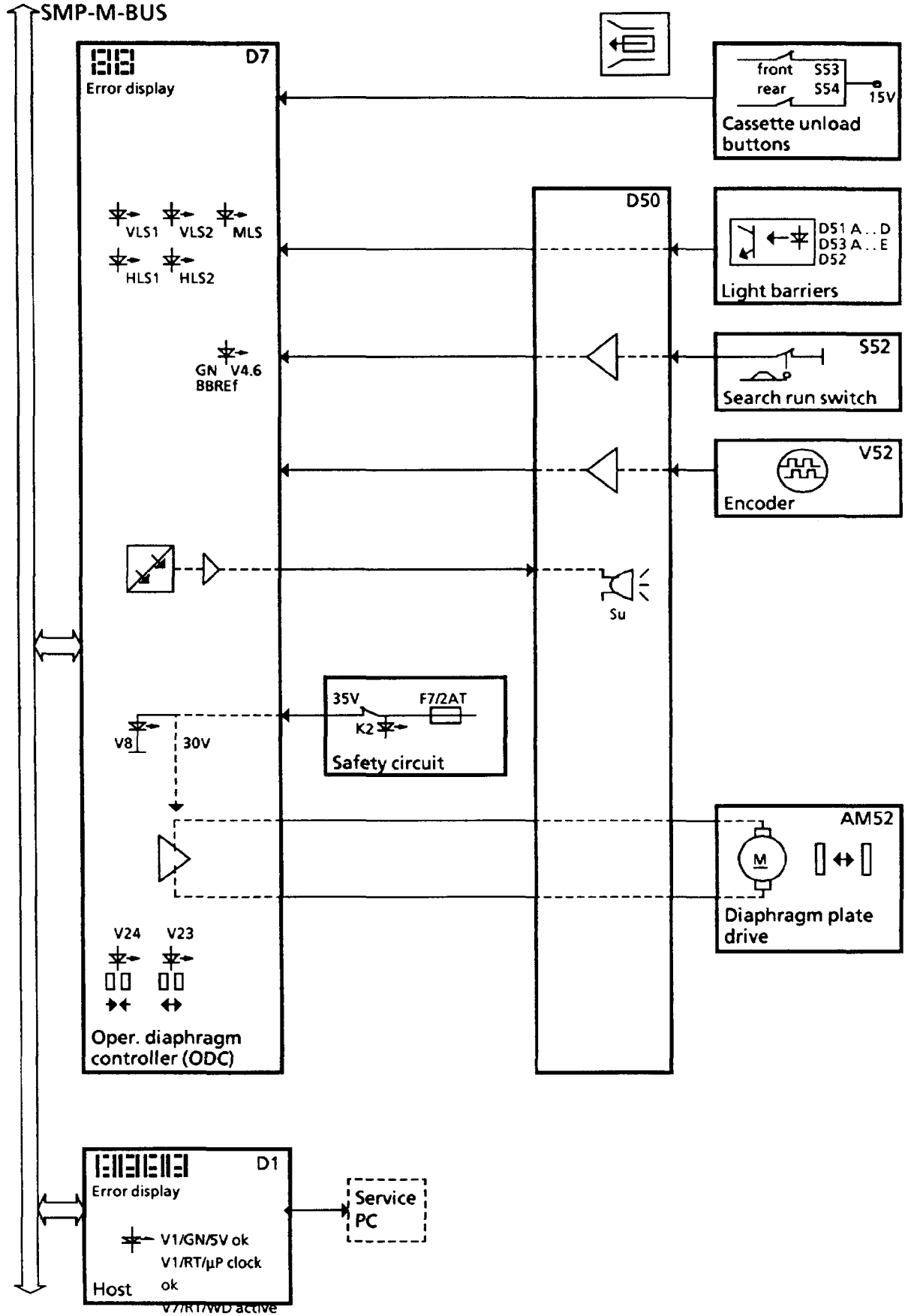


End of excursion range

No end of excursion range. Endless movement.

Note

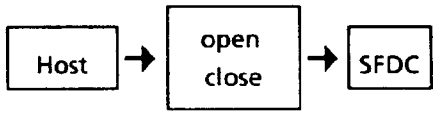
The setting is made with the service PC.


SMP-M-BUS
D7
Error display
VLS1
VLS2
MLS
HLS1
HLS2
GN
V4.6
BBREf
V8
30V
V24
V23
Oper. diaphragm controller (ODC)
front
S53
rear
S54
15V
Cassette unload buttons
D50
D51 A..D
D53 A..E
D52
Light barriers
S52
Search run switch
V52
Encoder
Su
35V
F7/2AT
K2
Safety circuit
AM52
M
Diaphragm plate drive
D1
Error display
V1/GN/5V ok
V1/RT/µP clock
ok
Host
Service PC

Display		Reaction
VLS 1/2	LED on:	Front light barrier 1/2 interrupted
HLS 1/2	"	Rear light barrier 1/2 interrupted
MLS	"	Center light barrier interrupted
V1/D1	LED on:	Processor clock pulse faulty
V7/D1	LED on:	Watchdog has responded (software fault)
V4/D7	LED on:	Search run switch (SAREF) actuated
V24/D7	LED on:	Collimators close to the film close
V23/D7	LED on:	Collimators close to the film open
V13/D7	LED on:	Motor stop
V14/D7	LED on:	Brake active

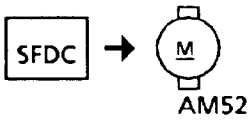
Open command
Close command

By actuation of the full-format key in the control panel.
By opening, closing the collimator.



Motor control

The spotfilm device controller SFDC (D7) directly controls motor AM52. The motor voltage is pulse width modulated.



Motor control and opening width of the diaphragms

The SFDC controls the adjusted rotating speed with encoder V52 and determines the opening width of the diaphragms by counting the encoder pulses.

Search run

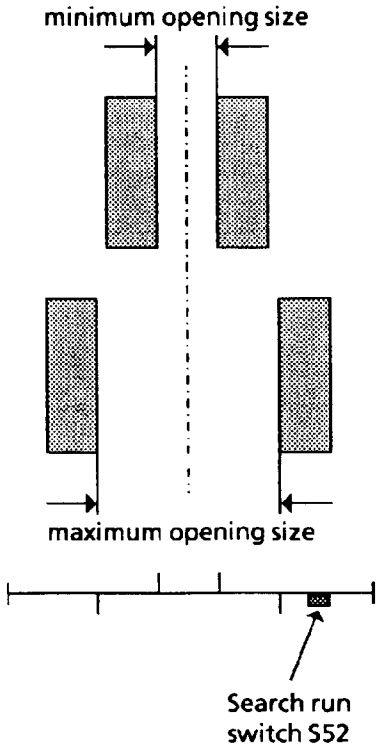
To define a relative zero point, a search run is necessary (S52). This takes place after reset or system run-up.

End of excursion range

The maximum and minimum opening size is defined by the software. The end of the excursion range is not monitored.

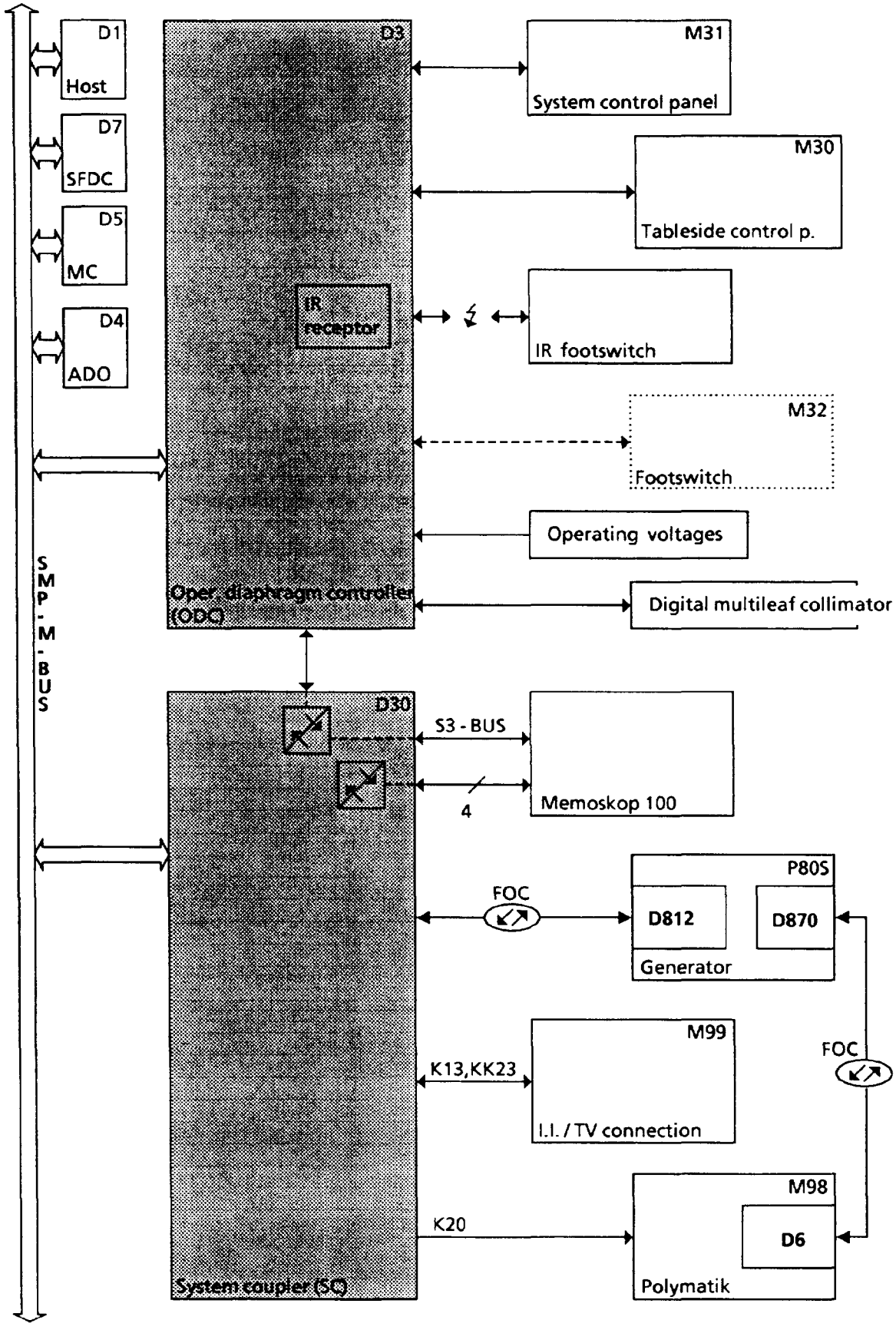
Note

The setting is made with the Service PC.



CHAPTER 5

5-2 Survey
5-4 Example DR exposure


D1
Host
D7
SFDC
D5
MC
D4
ADO
D3
M31
System control panel
M30
Tableside control p.
IR receptor
IR footswitch
M32
Footswitch
Operating voltages
Digital multileaf collimator
Oper. diaphragm controller (ODC)
SMP-MBUS
D30
S3 - BUS
4
Memoskop 100
P80S
FOC
D812
D870
Generator
M99
K13,KK23
I.I. / TV connection
FOC
M98
K20
D6
Polymatik
System coupler (SC)

Operation/diaphragm controller BBC (D3)

The ODC is the interface to and from the input elements.

- System control panel
- Tableside control panel
- IR footswitch
- Footswitch
- Digital multileaf collimator (not explained in detail here)

Further functions:

- Monitoring of the operating voltages and safety switches of the unit
- Serial interface to the digital multileaf collimator

Serial data transfer takes place via a two-wire line. The data communications protocol (DUEP) is standardized and has proved successful in other units (e.g. Siremobil 2000) . Function and error displays have been explained sufficiently in the chapter "Motor control".

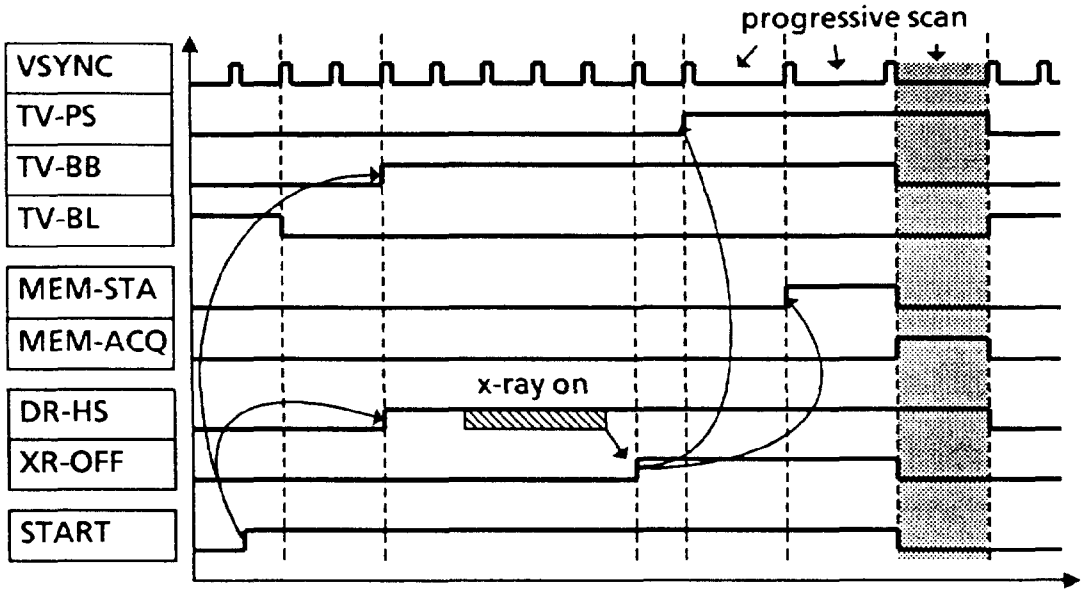
System coupler SC (D30)

The system coupler performs the following tasks:

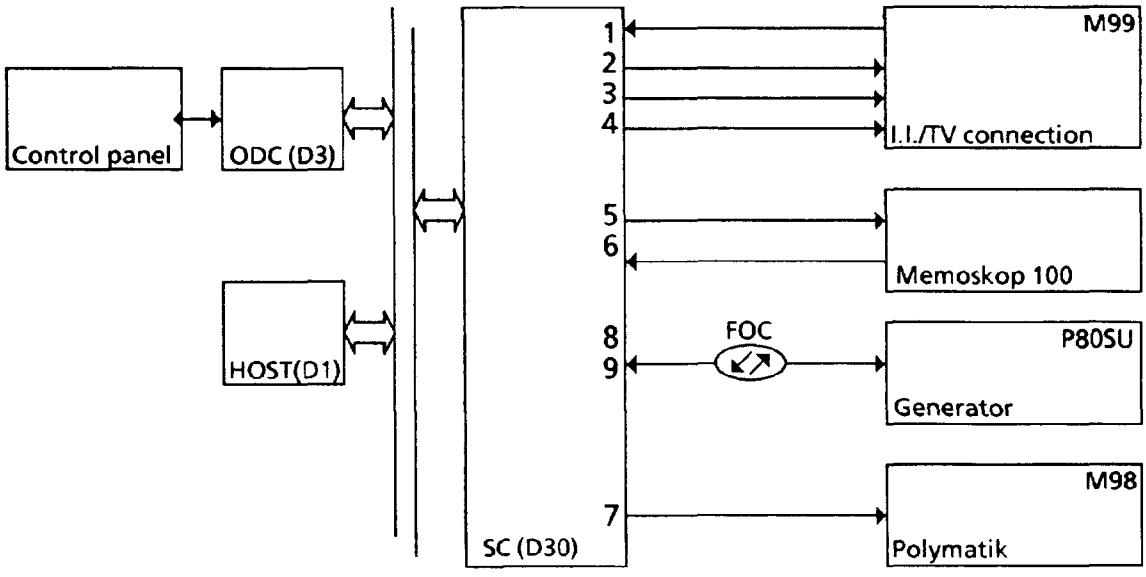
- Control panel simulator for the generator (via FOC)
- KK interface simulation for the generator (via FOC)
- Image memory control
  The configuration and programming (download) takes place via the serial, V-synchronous data bus (S3 bus). The data flow is controlled by the ODC. The four control signals of the memory:
  - Memory start (MEM-STA)
  - Acquisition (MEM-ACQ)
  - Download
  - Programming voltage

  are permanently wired lines.

- Control of the TV system.



1 VSYNC	Vertical synchronous pulse from the TV system
2 TV-PS	Progressive scan
3 TV-BB	Beam blank
4 TV-BL	Bias light
5 MEM-STA	Image memory start
6 MEMACQ	Acquisition (image memory acquires image)
7 DR-HS	Bright sector (release of radiation)
8 XR-OFF	x-ray deactivated (radiation end)
9 START	Run state machine (start of sequencing control)



Storage shot (DR exposure)

General

The function of the system coupler (D30) is explained with the example of a DR exposure.
It constitutes the interface from the Uroskop to
- I.I./TV system (via the M99, signal distributor)
- Generator and to Polymatik
- Image memory Memoskop 100

M99

Most signals are transmitted directly to the components (I.I. Z96, videomed N) via the M99. Some are distributed via the relay PC board D1 in the M99
These are the following signals:
- Zoom changeover
- Image inversion
- Hand gain
- Bias light
- Progressive scan
- Radiation on
- Automatic stop
- AVR stop
- Beam blank
- Vertical synchronous pulse (to the SC)

Memoskop 100

The memory requires a start signal and acknowledges this.
- MEM-STA Image memory start
- MEM-ACQ Image memory acquires images

Generator P80SU

The connection to the generator is a fiber-optic cable (serial interface) via which the following telegrams are transmitted:
- Control panel functions (direct technique/indirect technique)
- KK interface signals (e.g.: Radiation on/off)

DR exposure

The **START** signal introduces a DR exposure. It is triggered by actuation of the exposure button on the control panel.
The ODC (D30) transfers this exposure request to the host (D1). The host checks if this request is permissible and sends it to the system coupler.

VSYNC (1)

The VSYNC of the TV system synchronizes the entire sequencing control in the system coupler (D30).

TV-BL (4)

Switches off the bias light.

TV-BB (3)

The BEAM BLANK prevents the TV camera tube from being read out (beam current suppression) during radiation.

DR-HS (7)

The BRIGHT SECTOR signal causes possible radiation release in the generator via the Sircamatic control (D4).

XR OFF (8)

XR OFF (radiation off) enables the TV system for progressive scan.

TV-PS (2)

This signal switches on progressive scan. Two deflection periods serve for building up the vertical deflection, In the third deflection period the target of the TV camera tube is scanned and the image information is read into the memory.

MEM-STA (5)

Causes the start of the image memory.

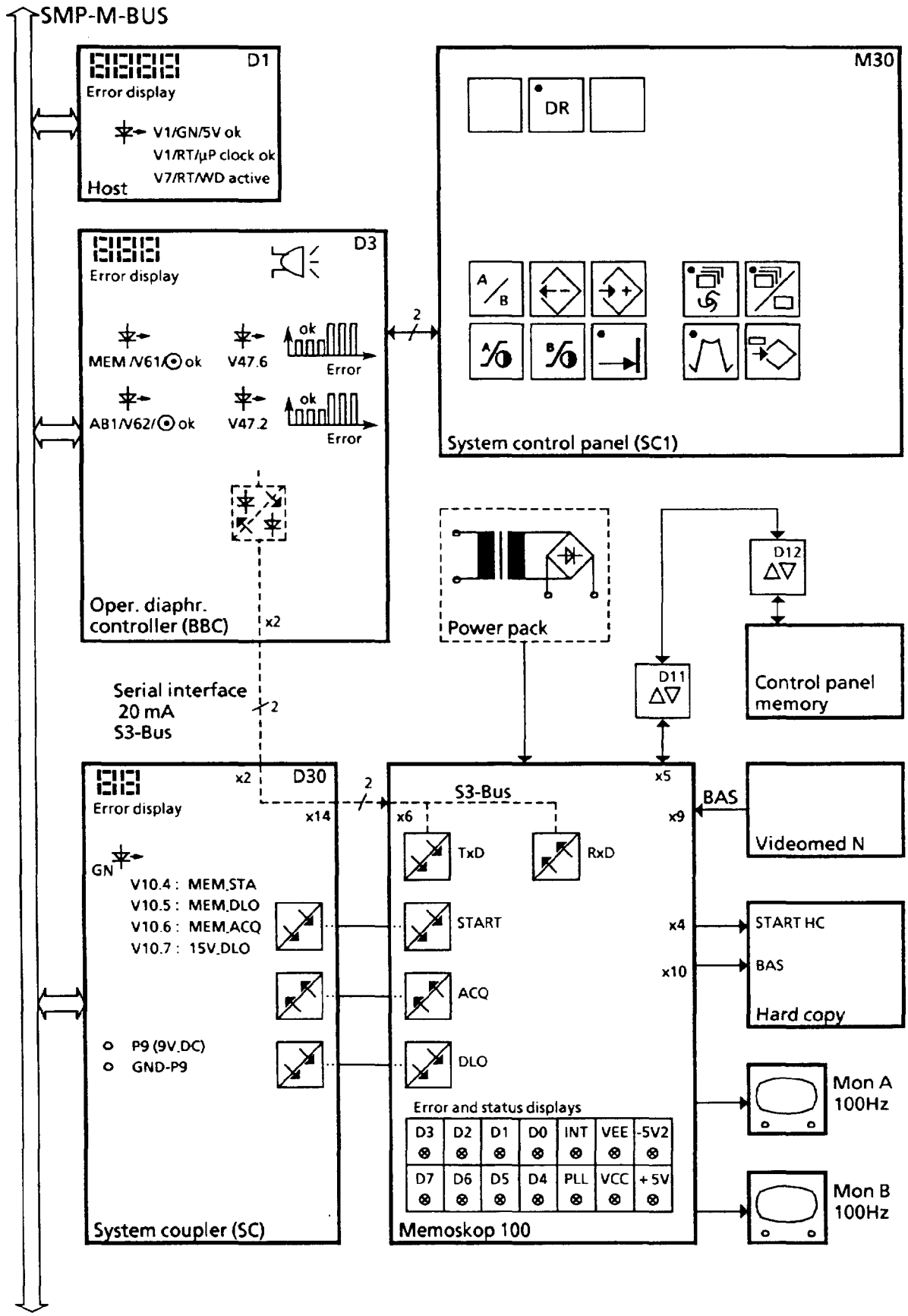
MEM-ACQU (6)

The acknowledgement from the memory indicates the read-in of the B-signal. After this the DR exposure is completed.

Memory control

6-2 Survey

CHAPTER 6


SMP-M-BUS
D1
Error display
V1/GN/5V ok
V1/RT/µP clock ok
V7/RT/WD active
Host
M30
DR
D3
Error display
MEM /V61/ ok
V47.6
ok
Error
AB1/V62/ ok
V47.2
ok
Error
2
System control panel (SC1)
Oper. diaphr. controller (BBC)
x2
Power pack
D12
D11
Control panel memory
Serial interface 20 mA S3-Bus
2
x2
D30
Error display
x14
2
S3-Bus
x6
TxD
RxD
x5
x9
BAS
Videomed N
GN
V10.4 : MEM.STA
V10.5 : MEM.DLO
V10.6 : MEM.ACQ
V10.7 : 15V.DLO
START
ACQ
DLO
x4
x10
START HC
BAS
Hard copy
P9 (9V.DC)
GND-P9
Error and status displays
D3 D2 D1 D0 INT VEE -5V2
D7 D6 D5 D4 PLL VCC +5V
Mon A 100Hz
Mon B 100Hz
System coupler (SC)
Memoskop 100

Tasks

The image memory (Memoskop 100) has the following tasks:

- Noise reduction of the images filmed with the TV camera
- Contrast enhancement
- Storage of images
- Display of images on the monitor

Noise reduction

This system uses two different noise reduction techniques:

- Summation (with digital radiography)
- Moving weighted averaging (MWA) (with fluoroscopy)

Start

Start brings the memory in the "acquisition" status and leads to one of the following processes (depending on the mode of operation selected):
:

MWA
Read-in of an image and weighting according to the k-factor selected.
Summation
Read-in and summation of k-images
With hard disk
additional transfer of the generated image to the hard disk.

Acquisition (ACQ)

This signal indicates that the memory is reading images from the camera.

Serial interface (S3-Bus)

The following data are exchanged via this serial interface:

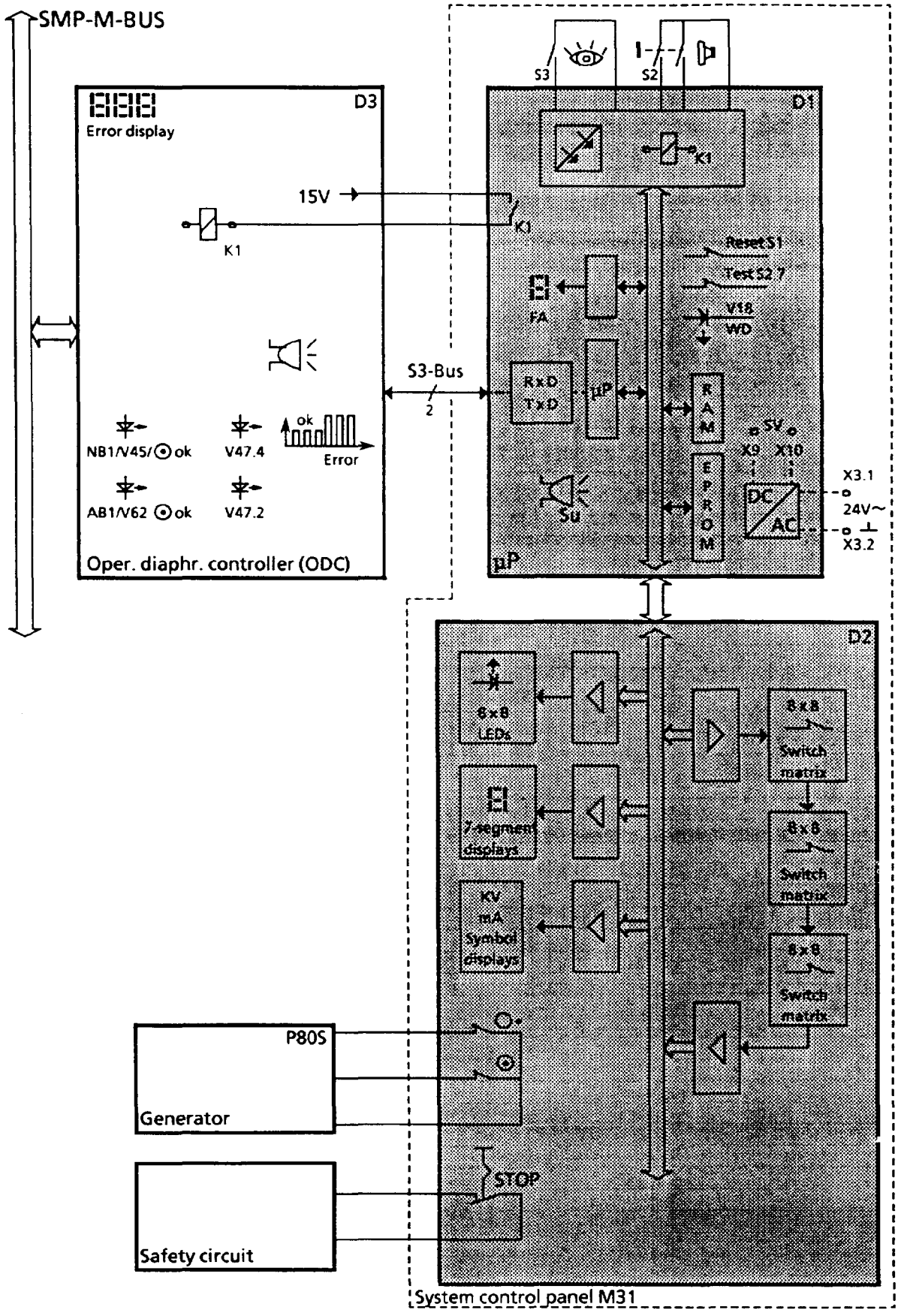
- Instructions for the memory how to do what.
- Information for the host (D1) about current activity of the memory.

Download (DLO)

Download means that the software is loaded into the memory (operating software). For this purpose, a 15 V dc programming voltage is applied to the memory.

PC board block diagrams

7-2 System control panel
7-4 Tableside control panel


SMP-M-BUS
D3
Error display
15V
K1
K1
NB1/V45/ ok
V47.4
ok
Error
AB1/V62 ok
V47.2
Oper. diaphr. controller (ODC)
S3-Bus
2
S3
S2
D1
K1
Reset S1
Test S2
FA
V18
WD
RxD
TxD
µP
RAM
EPROM
5V
X9
X10
DC
AC
X3.1
24V~
X3.2
Su
µP
D2
8x8 LEDs
8x8 Switch matrix
7-segment displays
8x8 Switch matrix
KV mA Symbol displays
8x8 Switch matrix
P80S
Generator
STOP
Safety circuit
System control panel M31

Components

The control panel consist of PC boards D1 and D2.

Aufgaben

D1: Processor control; controls the data exchange to the ODC as well as the key and display matrix.

D2: Consists of the key and display matrix.

Switches and displays

D1: **Reset S1** causes a new run-up (initialization) of the µP.

WD(V18) monitors to ensure correct program run.

Test(S2.7) If this switch is "on", the software branches into a test routine after reset.

Purpose

Detection of a defective switch.

Test run

With "S2.7 on" and subsequent reset of the D1 the max and Iontomat displays light up. *The test mode is switched on.*

If a key is actuated on the control panel, the associated "Sxxx" No. lights up in the " cGyxcm² "display field .

Readline short circuit

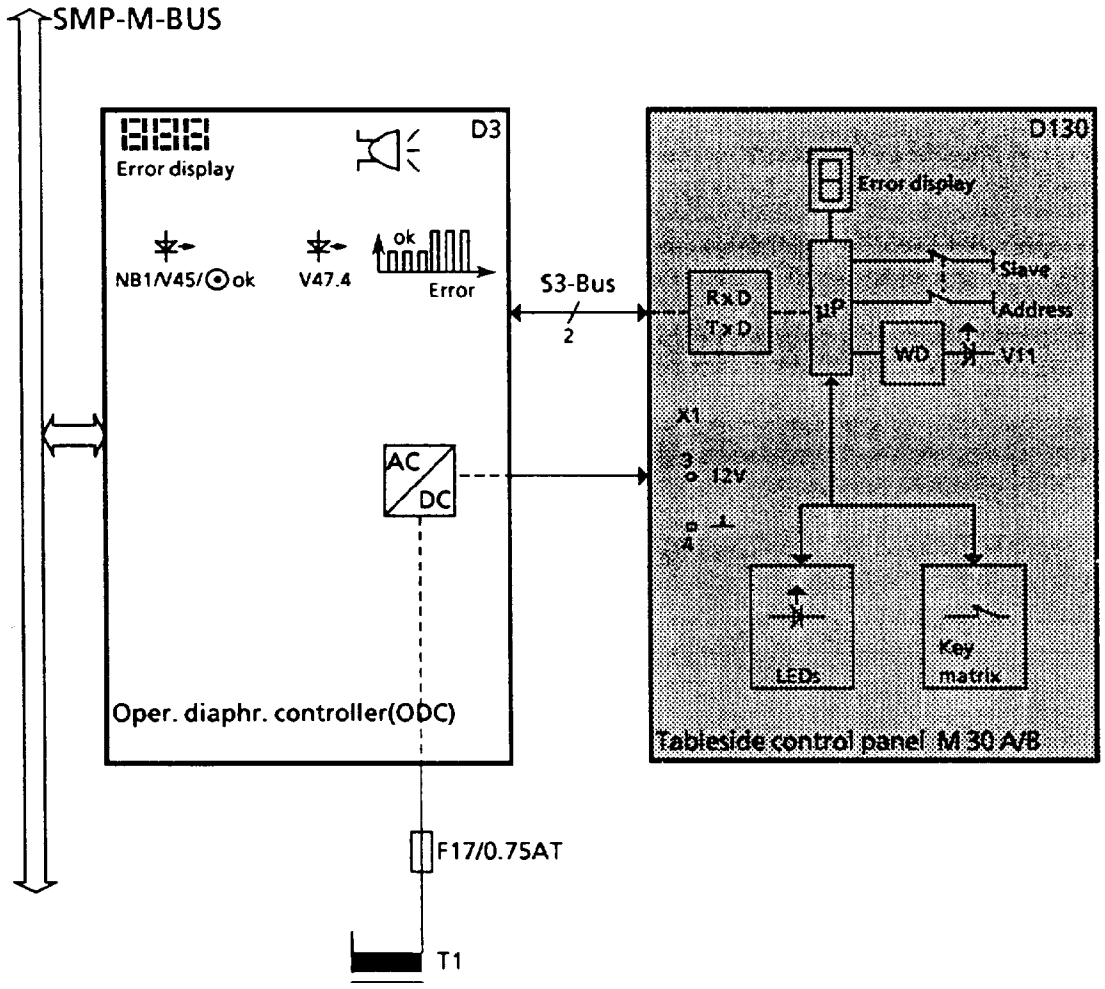
Display of the short-circuited keys in the **fluoro-KV , cGyxcm² , fluoro-mA, fluoro-min** displays.

Scanline short circuit

Display of the key with higher key number (flashing) in the **cGyxcm²** display.

End of test

By actuation of the "Exposure KV plus" key.
cGyxcm² display shows" **00000000**"


SMP-M-BUS
D3
Error display
NB1/V45/ ok
V47.4
ok
Error
S3-Bus
2
AC
DC
Oper. diaphr. controller(ODC)
F17/0.75AT
T1
D130
Error display
RxD
TxD
µP
Slave
Address
WD
V11
A1
12V
LEDs
Key matrix
Tableside control panel M 30 A/B

M 30 A/B Two system control panels can maximally be connected at the same time.

Slave address 1101 = Slave No. B = hand control panel. Programming of the DIP switch on the D130. **Must not be changed!!**

WD Watchdog: Responds "V11 on" if a software error occurs.

Error display The error display must read zero "0" and the decimal point must flash for the tableside control panel to function correctly.

D3 displays Hand control plugged in: V47.4 flashes with low brightness

Hand control plugged in: V47.4 flashes with higher brightness.

Error information

If the hand control is not plugged in and V47.4 flashes with low brightness, there is a short circuit in the transmission line.

If the hand control is plugged in and V47.4 flashes with higher brightness, the transmission line is interrupted.

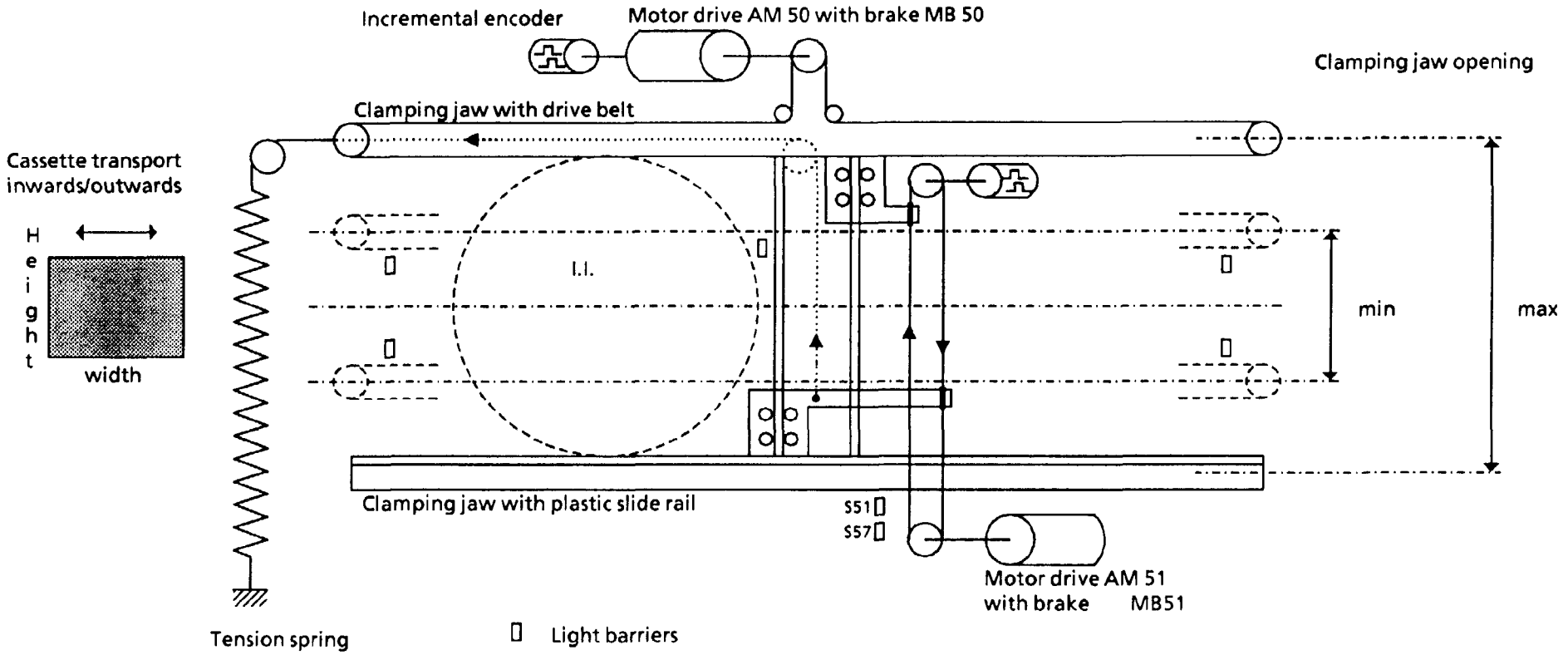
No data communication between D3 and D130:
The full-format, zoom 1,2 and 3 and AVR-STOP LEDs form a light that moves anticlockwise.

Data communication between D3 and D130 has been interrupted:
The above-mentioned LED flash simultaneously.

Mechanical

8-2 Spotfilm device, mechanical principle
8-4 Spotfilm device, diaphragm plate mechanism
8-6 Spotfilm device, clamping jaw mechanism
8-8 Spotfilm device, cassette width measurement
8-10 Spotfilm device, cass. height measurement

Spotfilm device, mechanical principle



Spotfilm device tasks

- Recognition of an inserted film cassette
- Clamping the film cassette
- Format sensing of the film cassette (height and width)
- Positioning of the film cassette in park, exposure and unload position
- Radiography and fluoroscopy release
- Control of the width diaphragms close to the film

Loading a cassette

See operating instructions

Clamping a cassette

By two clamping jaws which move transversely to the cassette transport direction. The clamping jaws move symmetrically towards the center. Thus the cassette is always centered to the longitudinal axis (cassette height).

Cassette clamping: by means of a tension spring
Open jaws: motor-driven with AM50

Cassette transport

by rotating transport belt (AM 50) on a cassette jaw.

Width diagram close to the film

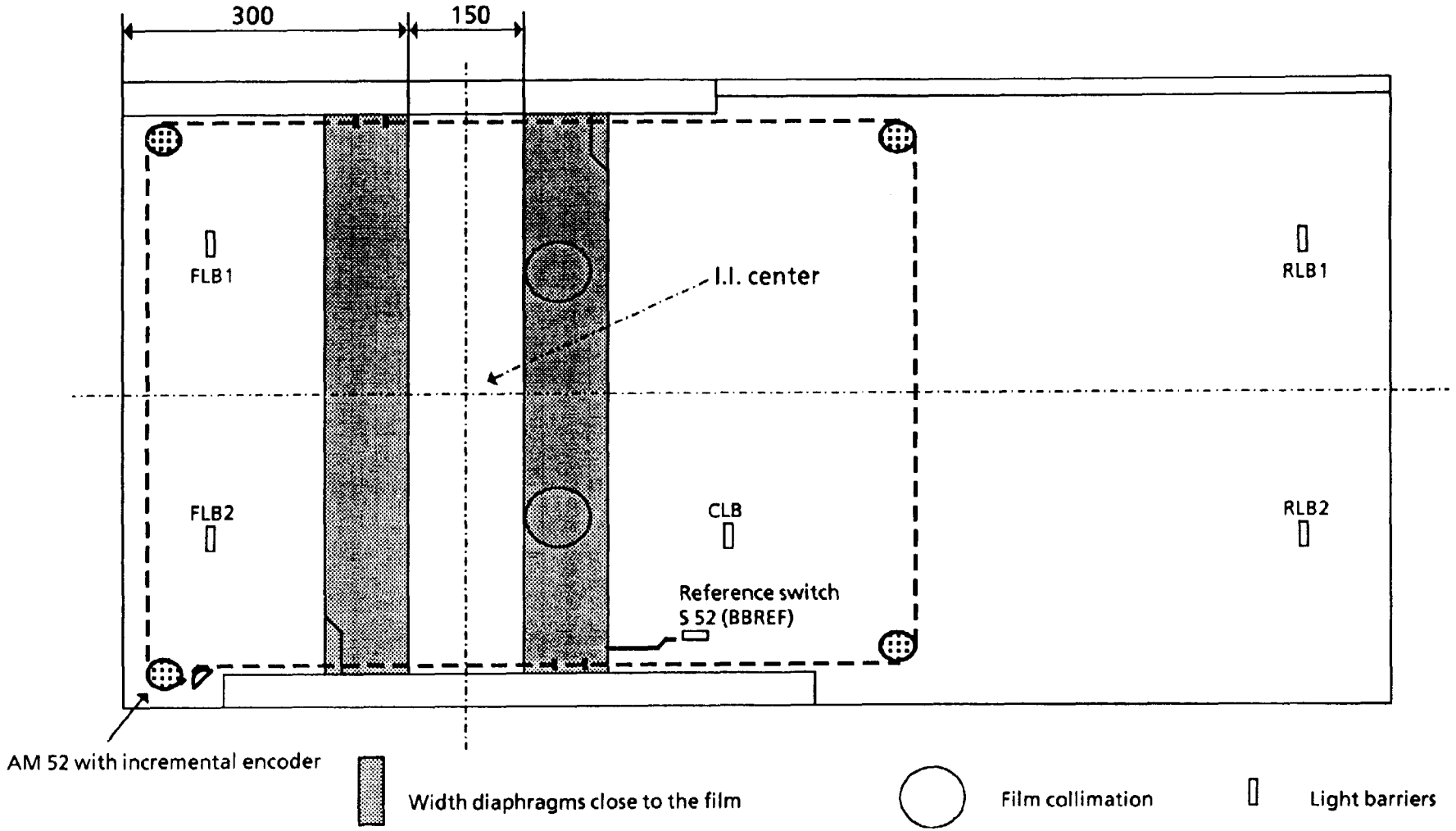
The width diaphragms close to the film move symmetrically to the central beam of the x-ray tube and transversely to the direction of movement of the clamping jaws (not visible here, see next page).

Spotfilm device run-up

after RESET or " Unit on".

First step	Cassette unloading Transport motor AM 50 is activated for approx. 3 sec. (even if there is no cassette in the spotfilm device). Buzzer signals : "Cassette must be removed". (see operating instructions)
Second step	Search run of clamping drive (AM51) Initialization of the drive by activation of search run switch S51.
Third step	Opening of the clamping jaws for cassette exposure The diaphragm drive performes a search run (initialization). Then the diaphragms open maximally. After this the run-up is completed.

Spotfilm device, width diaphragms close to the film



Spotfilm device, width diaphragms close to the film

Tasks

Exact format limitation, esp. with subdivision (between the two exposures).
Carrier for film annotation.

Width diaphragms close to the film

The width diaphragms close to the film move symmetrically to the central beam of the x-ray tube and transversely to the direction of movement of the clamping jaws.

Distance measurement

The width diaphragm drive AM52 is equipped with an incremental encoder, which enables relative distance measurement. In order to determine the absolute position of the diaphragm plates, a search run via reference switch S52 is necessary.

Search run

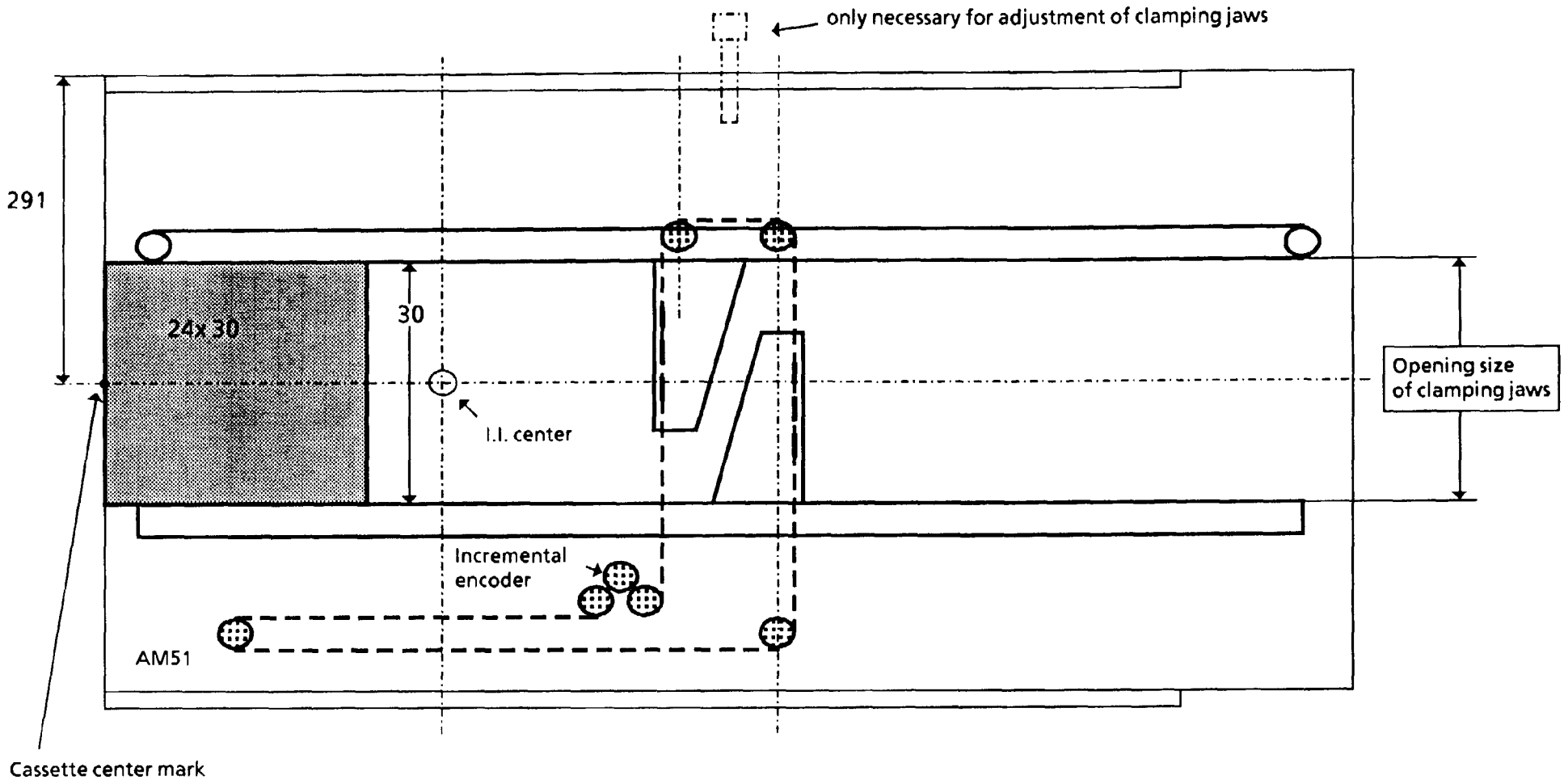
After a reset of the processor system, the spotfilm device performs a run-up. The diaphragms open until the reference switch S52 switches (maximum opening). Then the diaphragms move back into a rest position or to the computed film size.

Mechanical adjustment

The sizes 300 mm and 150 mm must be set during the mechanical adjustment of the diaphragms.

Note

The computed film size is indicated in the collimator display.


only necessary for adjustment of clamping jaws
291
24x30
30
I.I. center
Opening size of clamping jaws
Incremental encoder
AM51
Cassette center mark

Cassette clamping

By two clamping jaws which move transversely to the cassette transport direction.
The clamping jaws move symmetrically to the center. Thus the cassette is always centered to the longitudinal axis (cassette height).

Opening of clamping jaws

The clamping jaws are opened by motor power (AM 51).

Closing of clamping jaws

The clamping jaws are closed by means of a spring.
(The motor, which is short-circuited via a resistor, functions as a brake).

Incremental encoder search run switch S51

Determines the position of the clamping jaws, provides relative positioning values, thus making a search run (initialization) necessary.

Limit switch S57

Protects the clamping drive from excessive opening of the clamping jaws (to mechanical stop).

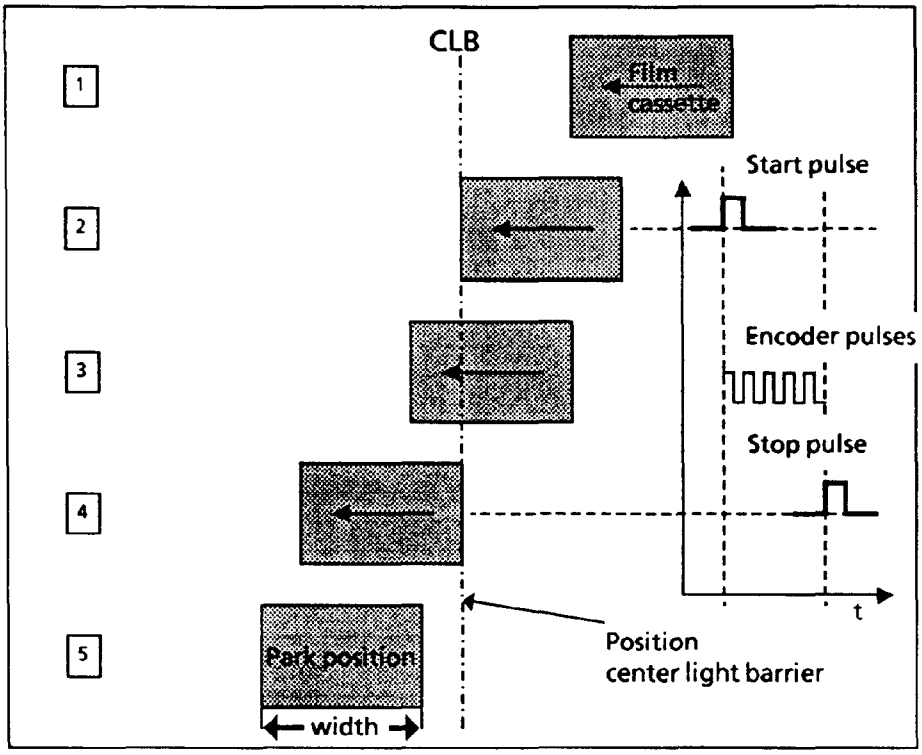
Electromagnetic brake

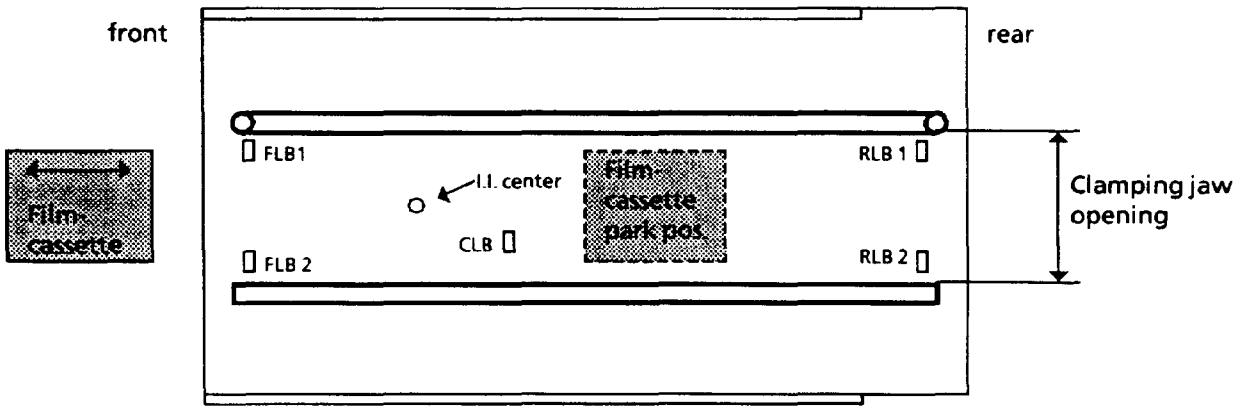
Allows the clamping jaws to hold the cassette in any position.

Note

The drive motor has been provided with a free running mechanism so that the clamping jaws can be opened manually.

Measurement by means of the center light barrier (CLB)





FLB 1 / FLB 2	:	Front light barriers
RLB 1 / RLB 2	:	Rear light barriers
CLB	:	Center light barrier

Cassette width

The cassette width is measured by means of the center light barrier (CLB).

1. The inserted film cassette (FC) moves towards the CLB.
2. The front edge of the FC triggers a start pulse.
3. As long as the CLB is interrupted, the encoder pulses are counted.
4. The rear edge of the FC triggers a stop pulse.
5. The FC is moved to the park position.

The encoder pulses make up the dimension of the cassette width.

Remember

Cassette transport

By rotating transport belt on a clamping jaw.

Transport distance

Measured by an incremental encoder.

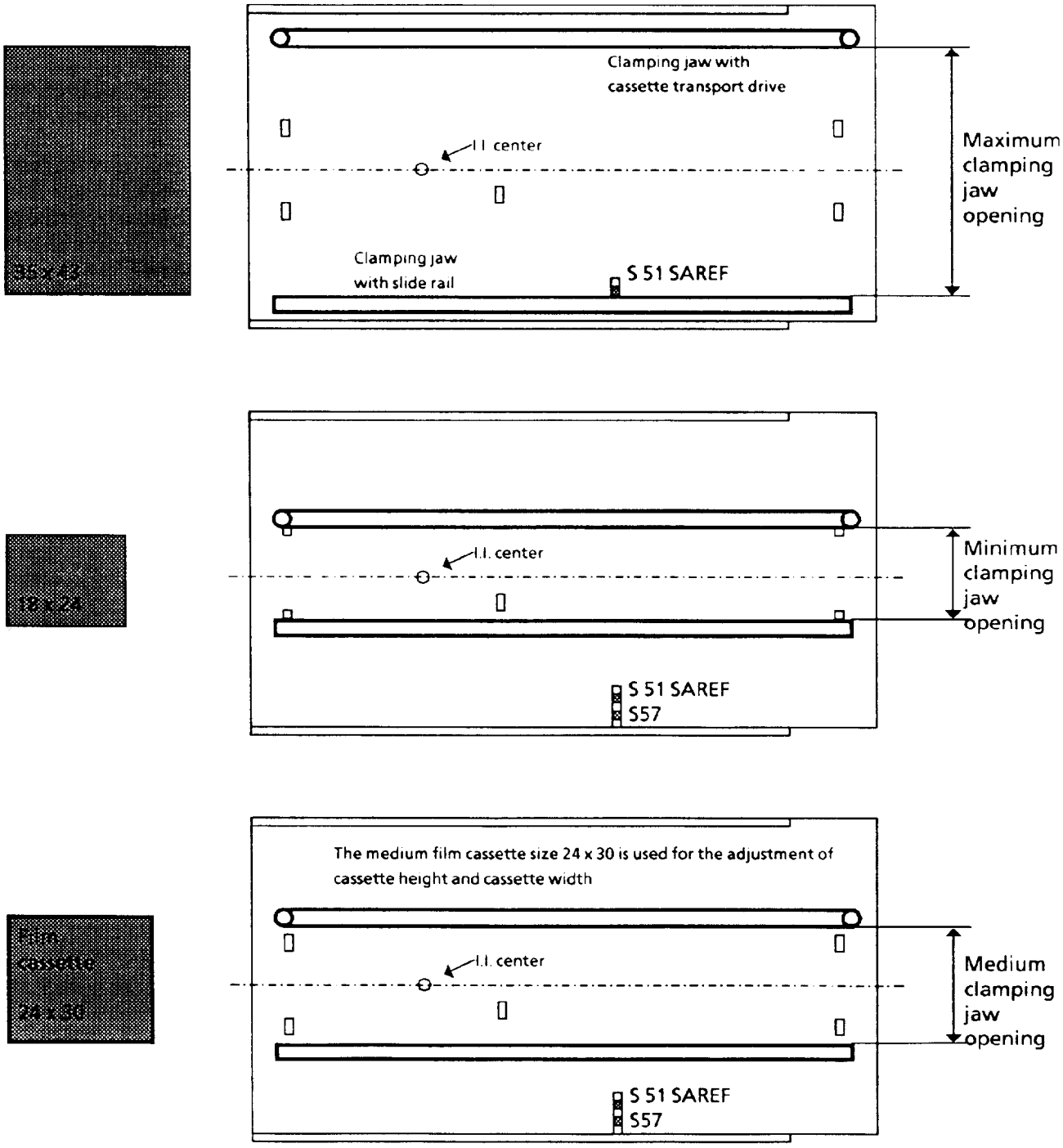
Cassette inward/outward movement

Possible from two sides.

Cassette recognition

Each loading side is equipped with two light barriers, which recognize the inserted cassette.

Cassette height measurement by means of the clamping jaw opening



▯ Light barriers

Cassette height

Limit values

The opening of the clamping arms is identical with the cassette height. The clamping arm opening is computed by means of the incremental encoder pulses.

Notes on adjustment

The limit values result from the defined cassette formats.
Maximum and minimum opening.

Maximum opening:
During normal operation the limit switch S57 must not be actuated with maximum opening of the clamping jaws. The switch point should be approx. 2 - 3 mm in front of the mechanical stop.
Using the service program, increase the software value (SWV) for maximum opening in small steps until limit switch S57 switches. (continuous opening and closing of the jaws). Then decrease the SWV until the spotfilm device run-up is normal.
Minimum opening:
Adjust the software value for minimum opening of the clamping jaws so that the smallest film cassette is recognized reliably. If this value is too high, the following effect occurs:
The microprocessor falsely recognizes an inserted film cassette and tries to eject it after the spotfilm device run-up, even if no film cassette is inserted.

Cassette clamping

Repetition

By two clamping jaws, which move transversely to the cassette transport direction.
The clamping jaws move symmetrically towards the center. Thus the cassette is always centered to the longitudinal axis of the spotfilm device.

Opening of clamping jaws

The clamping jaws are opened by motor power (AM 51).

Closing of clamping jaws

The clamping jaws are closed by a tension spring.
(The motor, which is short-circuited via a resistor, functions as a brake).

Incremental encoder Search run switch S51

Determines the clamping jaw position, provides relative positioning values, thus making a search run (initialization) necessary.

Limit switch S57

Protects the clamping drive from excessive opening of the clamping jaws (to mechanical stop).

Electromagnetic brake

Allows the clamping jaws to hold the cassette in any position.